FOOD MANUFACTURE
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FOOD MANUFACTURE

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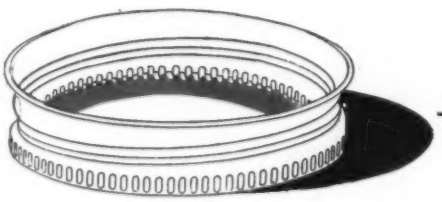

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FOOD MANUFACTURE

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The Editor will be glad to consider contributions from those engaged in the Food Industry. Articles intended for publication should be of a practical nature and accompanied by photographs or drawings when possible.

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FOOD MANUFACTURE

Vol. XIII, No. 3 March, 1938

Croydon Typhoid Report

THE REPORT on the Croydon typhoid epidemic has now been published.

Without any unfairness or bitterness it may be suggested that the epitaphs on those 43 gravestones might be, "Died of Faulty Liaison". It might well be that those deaths would not have occurred *if* the Medical Officer had known that work was being done in the Addington well; *if* he had been asked to examine the men engaged on that work; *if* he had been told that, during the progress of the work, no chlorination would be carried out; *if* the Assistant Water Engineer had advised the Borough Engineer that chlorination would be discontinued. There are other "ifs", but let these suffice.

It is a vital matter for the public safety that control of water supplies be tightened up. So far as Croydon is concerned, the supposition that "case A"—the carrier to whom the infection is attributed—should not obscure the implication of the danger of pollution from the gathering grounds.

Privies draining into the soil. How many carriers might use these? Chlorination should not be considered as a sole alternative to cutting out potential sources of pollution. Comment on the frequency of bacteriological tests has been copious, and confidence may be felt, we hope, that no slipping up on this score may be anticipated.

Practical Food Storage

The recent debate in the House of Commons on Food Storage evoked the declaration by Sir Thomas Inskip that defence was the first duty, home production the next: thus food storage comes third. It is also evident that this storage must be carried out in existing buildings, as Sir Thomas stated that, although he was not shutting the door against future storage plans, he could see no necessity for building. We evidently shall know very little about what is being done if "the essence of success in a policy of food storage is reticence"; but reading between the lines it would seem that the manufacturers themselves were going to be asked to do some storage.

We have been doing a few calculations on the basis of the old adage, "Heaven helps those who help themselves". At first sight the idea of the possibility that inhabitants of those conglomerations of brick boxes, euphemistically called flats, could use a part of them for storage as a means of war-time precaution, savours of fantasy. Probably the best, and certainly the cheapest, source of preserved protein is canned corned beef. A case of 12 tins, each containing 6 lb. net, represents approximately 20 lb. of protein. On the basis of 75 grams of animal protein as the average daily requirement per person, a case of corned beef represents a full supply for one person for approximately four months.

Now, a case such as has been described occupies a fraction over 1½ cubic feet, and ten cases piled on top of one another would occupy a little over 1 square foot of floor space. It will be seen that in odd corners sufficient protein for three people for one year may be readily stored. The first would not be within the capacity of the majority of the people, but 12-oz. tins might gradually be accumulated and would occupy approximately the same space as the 6-lb. tins per unit weight. In each 72 lb. of corned beef of best quality is contained nearly 11 lb. of fat, or based on the protein intake would provide 1 oz. a day for six months or almost 25 per cent. of the total fat requirements of the average man. We are well aware that man cannot live by corned beef alone, but we trust that the preceding may serve as a suggestion for handling the other classes of food in a similar way.

The Wheat Act

We have on several occasions referred to the weakness of the Wheat Act and the muddle brought about by an action in May, 1934, taken by a firm of wheat offal importers against the Wheat Commission. The whole trouble was that nobody seemed to know what was offal and what was flour. The Wheat Commission claimed quota payment on a consignment of middlings, and Mr. Justice Roche found that they were by-products and not flour and gave judgment against the Com-

mission. Finally the case went to the House of Lords, and Lord Macmillan was compelled to say, "If there were a precise and definitely ascertained process of milling wheat the definition might attain some measure of certainty, but the process is not a process characterised by an exactitude". It is now understood that the Ministry of Agriculture and the Wheat Commission are proposing to amend the Wheat Act. According to an agricultural correspondent to *The Times*, there is some uneasiness among farmers about the intentions of the Ministry of Agriculture in this matter. One of the proposed Amendments would bring certain wheat products used for stock feeding within the scope of the levy which, at present, is confined to flour.

Two Sides

As is usually the case, there are two sides to the question. The farmers maintain that it was the intention of the Wheat Act that the necessary assistance to wheat growers when market prices are low should be found by a levy on flour. This, they state, has proved no hardship to bread consumers because the levy disappears altogether when wheat prices are good. The farmers are now wondering why the Commission is seeking to subject certain offals used for stock feeding to the quota payment. The Commission, on the other hand, maintain that unscrupulous importers could procure flour in the form of middlings, free from quota and by a simple process of sieving obtain the flour after it has reached this country. They could also avoid the sieving test laid down in the Act by importing semolina, which could easily be converted into flour by passing it through a roller mill. We understand that the Commission has had the assistance of a committee of the leading cereal chemists in this country, and doubtless their deliberations will have resulted in devising some means whereby such deliberate fraud can be detected. It should not be difficult, after a consideration of the ash and fibre contents of alleged middlings, to decide whether an undue amount of flour is present and which could be separated, and it should be possible to devise a sieving test which would detect any addition of semolina. We feel sure that the Commission are seeking to safeguard the interests of the farmers and not to injure them, because any deliberate avoidance of quota payment is contrary to the interests of wheat growers. When the Commission's proposals are made known we do not think farmers will have much at which to grumble, but until such proposals are made known it would be wiser to leave the matter alone and postpone any post mortem until after the death.

Bigger Wheat Acreage

Those people who favour a large increase in home wheat production will derive considerable satisfaction from the recent statement issued by the Ministry of Agriculture based on returns made by farmers. It is to the effect that there is a considerable increase in the acreage devoted to winter wheat this season. It is estimated that the acreage will be at least 100,000 acres greater than last year. Of course, conditions have been much better this winter and last autumn. In the back end of 1936 acres of wheat land were water-logged and autumn sowing was considerably hampered, and the spring sowing did not make up for it. This season conditions have been almost ideal, and farmers have been able to get their maximum requirements of seed in during the autumn months. There are several factors which have encouraged farmers to grow more wheat. Prices have been better, and on a few occasions even exceeded the standard price figure of 45s. a quarter laid down in the Wheat Act. In addition to this the Government have decided to increase the amount of wheat covered by the quota by 33 per cent. from 6 to 8 million quarters. Farmers are thus assured that if they produce an extra third of their previous wheat crop it will not have the effect of reducing their returns or remaining on their hands. They will be guaranteed their 45s. a quarter. We agree that a certain amount of home-grown wheat is a national asset, but we must again point out that English wheat is as variable as the English climate and, in some seasons, very poor wheat is produced. Let us grow an extra 2 million quarters of English wheat by all means, but we must not rely on the quality, and increased home production should not blind us to the necessity for increased stores of foreign wheat in case of emergency.

Adulterated Self-Raising Flour

The recent prosecution at Greenwich when James Francis Green of Hammersmith was charged with giving a false warranty to a Greenwich grocer in respect of self-raising flour raises one or two interesting points. The flour was described as of "finest quality", but actually it contained at least 20 per cent. potato starch. The magistrate expressed the view that self-raising flour was regarded as flour of wheat and that the addition of this amount of potato starch constituted adulteration. We agree that this is probably correct, and

that nine hundred and ninety-nine people out of a thousand regard "flour" as flour of wheat. The other flours are always qualified: thus flour of maize is called cornflour, and so on. The unfortunate part of the matter is, however, that there is no official definition of self-raising flour or of flour itself for that matter. Theoretically there is nothing officially to prevent manufacturers diluting their flour with any other starch if it pays them so to do. Then again there is nothing to prevent them using an acid-raising ingredient containing 10 per cent. of gypsum, though this is most undesirable. It would be to the advantage of the self-raising flour trade, or at any rate to the respectable section of the trade, if some standards were laid down by statute. We agree that these would have to be elastic but, at any rate, the nature of the flour could be defined to the extent of say not less than 95 per cent. flour of wheat and the presence of more than 1 per cent. gypsum in the acid ingredient prohibited.

Nutrition in Denmark

In view of the fact that Denmark exceeds all other countries in the consumption of margarine and sugar per head, a recent paper by Johanne Christiansen of Copenhagen on nutrition and disease in Denmark is of considerable interest. The Danish diet is conspicuous not only for the large amount of fat poor in vitamins taken, but also for the small number of eggs consumed—only Finland consumes less. Until December, 1936, no margarine was vitaminised in Denmark, probably because the peasants feared the power of the margarine industry and were afraid that if vitamins were added to margarine, butter consumption would cease altogether. The peasants, incidentally, eat no butter themselves, it being regarded as a luxury, and any not consumed by the wealthier classes is exported.

Effect of Rationing

The extremely high consumption of margarine in Denmark may, in part, be explained by its cheapness (but the very big consumption of expensive things like tobacco and coffee rather contradict this). Probably a stronger reason is the energetic propaganda of Hindhede during the last thirty years, which has stressed the idea that vegetable margarine is as good as, and much cheaper than, butter, and that animal protein and fat are "poison" and "luxury". He interpreted as the best proof of his theories the classical illustration given by Denmark in 1918 of the correlation between nutrition and disease. He maintained that the low mortality of that year was due to a sort of vegetarian diet brought about by rationing. This suggestion, while taken up eagerly by food faddists in some countries, has received much criticism, which has culminated in the recent paper by Christiansen. He summarises his views by stating that the Danish nation consumes more fat devoid of vitamins and sugar per head than any other nation. This faulty diet has a harmful effect on the national health, and infant mortality remains high in spite of great efforts to lower it. He maintains that Hindhede's theory that the excellent health of the Danes during 1918 was due to a sparse and largely vegetarian diet enforced by war rationing is not justified by the facts. During the rationing period the consumption of "protective foods" and animal proteins was, in fact, unusually great, for no margarine was available, and the use of dairy products was more widespread than usual.

Frozen Packs

In the present issue reference is made to quick freezing of various articles of food. It is also announced that the production of frozen vegetables and fruits, to the extent of 24 tons per day, will begin in this country in June, the company concerned being British-controlled.

This year, therefore, should see the manufacture of a number of frosted foods done for the first time in this country on any appreciable scale.

The opinion seems to be almost general that frosted foods would not lend themselves to conditions in this country, but surely those conditions are not so fundamentally different from those in the United States as to warrant undue pessimism regarding their future? The idea that the sole application of frosted foods is to the sale, for instance, of strawberries at Christmas, is one which materially limits the possible aspects of the subject.

Turning to the technical side of this comparatively new branch of the food industry, such industry possesses the advantage of being enabled to draw upon a huge accumulation of scientific research, and by this reason alone may be expected to progress rapidly. When the canning industry started, comparatively little was known about the biological and other aspects of food, and the enterprising pioneers came up against innumerable difficulties which they were obliged to tackle empirically. The highly scientific trend of research is exemplified by some interesting experiments carried out by Helen F. Smart and B. C. Brunstetter, on spinach and kale.

Preliminary Treatment

Scalding or "blanching" is an essential pre-treatment for vegetables going into the frozen pack, if desirable colour, flavour, and texture are to be retained. Apart from the reduction of microbial content, one of the principal benefits is the destruction or inactivation of those enzymes responsible for loss of flavour in raw vegetables. These enzymes are active even when foods are frozen, as has been pointed out by various workers. Techniques for scalding spinach have been the subject of many experiments, and, so far as spinach and kale are concerned, scalding in steam seems to be better than scalding in water, owing to the large loss of valuable food material when the latter is used. The scalding period for leafy vegetables must be carefully ascertained in order that, while enzymes are inactivated, the texture of the vegetable is not adversely affected.

An interesting experiment in connection with spinach consisted of adding calcium chloride solution. This substance was added to determine whether the "furring" of the teeth when eating spinach (due to the action of free oxalic acid) might be avoided by precipitating the oxalic acid as calcium oxalate, and that any undesirable flavour owing to the action of free oxalic acid might be eliminated at the same time. As a result of experiments the use of calcium chloride is not recommended at the present time, and further work is suggested to test its various effects, for instance, its influence on the vitamin C content.

Much work has been done on the effect of low temperature on growth and survival of micro-organisms, especially those which survive the scalding operation. A wide diversity of microbial species have been isolated from frozen spinach and kale, but these types are those ordinarily found on fresh vegetables and in no way affect the wholesomeness of the product, *provided* that, in cooking, the vegetables are placed in boiling water prior to, or immediately after, de-frosting. It is probable that new technique, even in cooking, may have to be applied when frosted vegetables and fruits become common in this country, but it will not be the fault of the investigators if all the snags are not known.

White *v.* Brown Bread

"There is little doubt but that a dictator of diets, established in Great Britain at the present time, with unlimited power over men and materials could, with a few strokes of the pen, at once raise physique and well-being to a very significantly higher level than that which now exists. But there is one curious exception. It concerns the commonest of all our foodstuffs, ordinary bread." Thus, Dr. W. O. Kermack in *Science Progress*.

The "white *versus* brown" controversy has raged for over a quarter of a century, but recent work has weakened the argument of the white bread adherents. Harris and Leong (*J.S.C.I.*, 1937, **56**, 195T), Harris (*Biochem. J.*, 1937, **31**, 812), and Baker, Wright and Drummond (*J.S.C.I.*, 1937, **56**, 191T) have investigated the vitamins which exist in various types of bread. These workers give the methods of assay employed, and the difficulties which ensue in carrying them out.

Harris finds that ordinary white bread contains less than 0·2 international units per gram of vitamin B_1. Bread made from wholemeal—that is, including the wheat germ and the pericarp or bran, as well as the starchy endosperm—usually contains over 0·8 units per gram, and may be as high as 1·0 unit per gram. The assays of bread reported by Baker, Wright and Drummond give results in substantial agreement with those of Harris.

Beri-Beri

The point arises whether this loss of vitamin is likely to be of serious practical importance. Information as to the amount of vitamin B_1 required by the normal adult to prevent beri-beri has been collected by Cowgill (*The Vitamin B Requirement of Man*, 1934, Yale University Press). The average adequate diet ought to contain at least 500 international units per day. Baker, Wright and Drummond find that the average working-class diet contains only 300 units of vitamin B_1. Dr. Kermack asks, what then would be the effect of substituting wholemeal bread for white bread? It appears that, over a wide range of income levels, the average consumption of bread remains remarkably constant—slightly over 250 grams per day. This quantity of white bread is not likely to contain more than about 30 units, while as good wholemeal bread, properly prepared, it should contain over 200 units. Thus the alteration in the type of bread eaten would at once raise the vitamin B_1 content of the diets consumed in this country from 300-500 units to 500-700 units. It would, in fact, raise the intake of this factor from a sub-normal to an adequate level.

Judged by the data obtained from these experiments, it would seem that Dr. Kermack is correct in his opinion that the matter is one calling for immediate attention from the authorities, but the last-named authors say, "our present problem might perhaps be more easily solved if attractive wholemeal breads were available at prices at least as low as those of the common variety".

EARLIEST REFRIGERATION

10,000—20,000 B.C. Nature was the first refrigerator by virtue of the fact that Arctic explorers have discovered prehistoric monsters frozen solid in ice, and in this condition perfectly preserved.

2,500 B.C. The Egyptians, with their high degree of civilization, fanned porous jars to cool water.

1,500 B.C. and onwards. In India and elsewhere water was put into shallow pans which rested in dry straw to a depth of 1 foot and left overnight. Even when the night temperature was as high as 40° F., the water froze to a thickness of 1 to 1½ ins. before sunrise. The next recorded experiment by man at refrigeration was made in . . .

1625 A.D. Lord Chancellor Francis Bacon was driving in a carriage near Highgate in the March of that year. It was snowing heavily at the time, and it suddenly occurred to Bacon to ascertain whether snow would act as an antiseptic. He alighted from his carriage and bought a fowl, which he stuffed with snow with his own hands. The fowl kept fresh for a short time. Refrigeration made its greatest advances, however, in the more enlightened nineteenth century. An attempt was made in . . .

1861. Carré was the man who experimented with an ether machine and afterwards with ammonia.

1873. This was the year when Ch. Tellier, a French engineer, who is credited with the invention of present-day refrigeration principles, sent a communication to the *Académie des Sciences* on artificial refrigeration. Tellier started the ice-making industry on land, first using methyl alcohol, which he made in his laboratory. In the same year a cargo of meat was brought from Melbourne in a ship fitted with Harrison's ether machine, but the result was a failure.

1876. In this year the *s.s. Réfrigorique*, a ship equipped with a refrigerating machine driven by an engine of 300 h.p., went from Rouen with a quantity of beef and mutton. She called at Lisbon to take in more meat to complete the experiment. On arrival at Buenos Aires on December 25, after a 3½-months' voyage, it was found that the Lisbon meat was in quite good condition. The meat from Rouen, however, was not nearly as good. On the return voyage from Buenos Aires the *Réfrigorique* took on 35 tons of meat, and after a voyage of 100 days the meat was found to be in a good enough condition for safe consumption. A further and, as it proved, wholly convincing attempt was made in . . .

1877. Another French ship, the *s.s. Paraguay*, started from France with a cargo of mutton and beef bound for Buenos Aires. After a seven-weeks' voyage the ship arrived on September 23 with the meat in very good condition. The *Paraguay* returned from Buenos Aires and made another successful trip with a cargo of 80 tons. The problem of refrigeration was well and truly solved! Other notable voyages took place afterwards. There was one in . . .

1880. In February the *s.s. Strathleven* arrived in London from Sydney with 40 tons of frozen beef, mutton and lamb. Here was the origin of the frozen meat trade with Australia, although the fuller development of transport of meat by sea did not proceed until 1885. As an instance of this, in . . .

1887. The *Belgrano* and the *Porteña* were specially constructed for meat shipment. The science and industry of refrigeration has progressed enormously since those early days. It is because of this and because this science is so important to the food manufacturer that, in the following pages, we present a series of articles and reviews on the . . .

LATEST REFRIGERATION

Firstly, John J. Piqué, of the Atmosphere Control Company, comprehensively surveys the progress made in food cold storage and discusses the latest developments. A short article on a new and important development in the U.S.A., that of refrigeration in shops, comes next. T. Crosbie-Walsh, F.I.C., has made a special visit to a great ice-making plant in North-Eastern England, and records his impressions in a profusely illustrated description. The freezing and cold storage of herring by A. Banks, Ph.D.(Liv.), A.I.C., of the Torry Research Station, is the next important contribution, which sheds considerable light on this vast British industry. P. S. Jewell and J. P. Hallett, of the Swansea Technical College, have collaborated to contribute a suggestive article on the use of refrigeration in the making of confectionery. A continental viewpoint is given in the concluding article on the refrigeration of fruit and vegetables in France.

PROGRESS IN FOOD COLD STORAGE

By John J. Piqué

IN THOSE countries where they were available, ice and snow must have been used from time immemorial as a means for preserving foodstuffs. The first actual experiment on record, however, with ice as a means for preserving food appears to be the one made by Lord Chancellor Bacon, who kept a chicken in fresh condition for a short time by stuffing it with snow. It was not until the beginning of the nineteenth century that the method began to a certain extent to be used commercially, when "ice houses" were erected in this country in which ice imported from Wenham Lake, America, was the means of chilling the air in these "houses" used for the storage of perishable produce, mainly meats and fish. Later on, natural ice was imported from Norway.

Artificial Ice

The manufacture of artificial ice was developed on a commercial scale from about 1875, the ice being made specifically for the chilling of foodstuffs. During the following years the construction of refrigerating machines underwent various modifications and their cooling power was gradually applied direct to food storage, *i.e.*, direct expansion cooling grids, brine cooling grids and cold air circulation from a central cooler, which took the place of ice. The construction of cold stores, of their insulation, etc., underwent notable improvements.

The population of this country was, about that time, increasing rapidly; certain foodstuffs such as meat were rather expensive for the working classes, and those engaged in the refrigerating industry turned their thoughts to the possibility of importing meat from countries where there was a large supply at reasonable prices, such as the Argentine Republic and Australia.

Early Developments

The first cargo of chilled meat was sent over from the United States to this country in 1875 by the well-known firm of Eastmans. This beef was carried in insulated holds in the ship, cooled with ice, and fans were provided to maintain adequate air circulation.

Two years later a ship was equipped with refrigerating machinery and cooled holds in which the first cargo of chilled meat was brought from the Argentine to France, and a few months later another vessel carried the first shipment of frozen meat from the Argentine Republic.

It was in 1880 that the first cargo of frozen meat reached this country, when the *Strathleven* brought 40 tons from Australia. Three years later 5,000 carcases of frozen mutton were brought over from New Zealand in the *Dunedin*. From then onwards the import trade in chilled and frozen meat expanded continuously.

Difficulties Occur

Many setbacks were experienced. Many a time it was found that a cargo of meat arrived in a spoilt condition, or that on the same ship some meat in one hold kept in good condition and not in another hold, or that some meat in a certain part of a hold did not keep as well as in another part. Similar troubles were experienced in land stores and in connection with other foodstuffs.

The troubles were ascribed to faults in the construction of the plant, to deficiencies in air circulation and other causes. Remedies and improvements were sought and thought out by the refrigerating engineers responsible for the design and the construction of the plant and stores. Little was known about the behaviour of foodstuffs in cold storage from the biological point of view, and of the effect of the storage conditions thereon; remedies were sought from the engineering angle. The only variables which were considered to influence the quality of foodstuffs were the temperature, the air humidity, and the air movement.

Systematic Research

It was only about twenty years ago that the behaviour and structure of foodstuffs during chilling, freezing and during storage, and the effect of the composition of the atmosphere surrounding the foodstuffs in storage, began to be studied in a systematic manner. Although an enormous amount of research and experimental work has been accomplished, there still remains more to be done. Though the temperature, the air humidity and the air movement are important factors, the results of experimental work, borne out in recent years by commercial practice, have shown that the composition of the storage atmosphere is one of the main factors governing the storage life and quality of stored foodstuffs.

The composition of pure air is:

Oxygen	20·93 per cent.
Carbon dioxide	0·03 ,,
Nitrogen (including argon)	79·04 ,,

But air can hold water vapour, mould spores, bacteria and micro-organisms, volatile substances, odours, various gases, impurities. Its composition can be altered to consist of more or less oxygen, carbon dioxide and nitrogen

than present in pure air. Some of these or a combination of some of them may greatly affect the quality of the foodstuffs.

Temperature Effect

The general effect of lowering the temperature of foodstuffs is to slow down the various changes which take place after death in all material of animal origin and after picking or gathering in that of vegetable origin, all of which changes result in the ultimate decomposition of the foodstuffs.

The lowering of the temperature also arrests the action of a number of types of moulds and bacteria which contaminate the surface of the foodstuffs originating, for instance, in the slaughterhouse and in the orchard or the field.

In all cases there is a set of conditions, for each of which there is a critical temperature, namely, chilling, freezing and storage.

Chilling, *i.e.*, the cooling of foodstuffs to a temperature higher than its freezing point, at which it can be kept for a certain time without any material alterations taking place in the structure of the tissues, so that at the time of eating it will be considered the same as fresh food. The longest time at which a foodstuff can be kept in the chilled state is when cooled to near the critical temperature. For foodstuffs of animal origin the critical temperature is the freezing point at which a certain amount of ice is formed in the muscle. For fruits and vegetables the critical temperature is that at which structure changes occur, upsetting the life respiration of the foodstuffs, known under the general term of low temperature breakdown.

The storage life of chilled foodstuffs is also influenced by the rate at which they are initially cooled and by the fluctuations in temperature. The storage life of chilled foodstuffs is, on the whole, rather short.

Frozen foods are practically non-perishable; their ultimate quality and palatability can, however, range from practically as good as fresh to a product without any taste or incomparable to the fresh product. These effects will be produced according to the method and rate of freezing and to the storage conditions.

Behaviour of Foodstuffs

Different foodstuffs behave quite differently under the same freezing. Thus it was found that mutton and lamb can be frozen hard, stored for a long time, and when cooked be of very good quality, while beef, treated the same way is, on cooking, found to be tasteless and dry. The same applies to some kinds of fish, and fruits and vegetables need special treatment.

The chemical analysis of all foodstuffs shows that they consist of a large proportion of water, for instance, 72 to 78 per cent. in beef, 63 per cent. in veal, 75 per cent. in carrots and 78·6 per cent. in plums. A small percentage of salts are also present and it is found that, when freezing foodstuffs, the water contained in them changes into ice, the amount of ice depending precisely upon the temperature to which the foodstuff has been cooled. (See Fig. 1.)

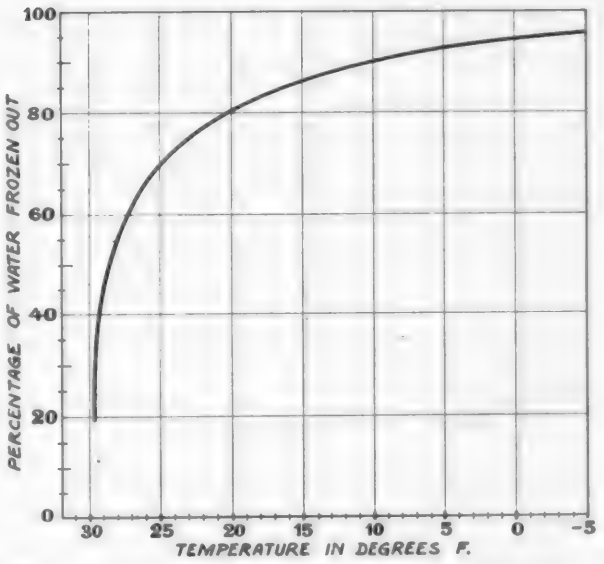


FIG. 1.—Ice content in foodstuffs at different temperatures.

The water freezes out in the shape of ice crystals; their size and pattern depend upon a number of factors, the most important of which are the water content of the foodstuff and the rate of freezing. In general it can be said that the smaller the ice crystals the less damage occurs to the structure of the foodstuff.

The various factors influencing the rate of freezing are:

The thickness and general shape of the material to be frozen.
The initial temperature of the material.
The thermal conductivity of the material.
The specific surface of the material.
The specific heat of the material.
The latent heat of solidification of the material.
The temperature of the cooling medium.
The thermal conductivity of the cooling medium.
The specific heat of the cooling medium.
The specific gravity of the cooling medium.
The movement of the cooling medium over the material.

Freezing of Beef

The freezing of beef-muscle affords a good example of structural alterations which occur at various rates of freezing, and the freezing of beef-cuts in waxed cartons an example of the effect of the shape and size of the cartons.

The freezing point of lean meat is 30·2° F. Fig. 1 shows that the bulk of ice is formed when lowering the temperature of the meat from 30·2° F. to 23° F.

Damage to the muscle fibres of meat, resulting in drip on thawing with consequent loss in flavour, has been found to be the least marked when the cooling to 23° F. is carried out in the shortest time. The rate of cooling and freezing is accelerated if the initial temperature of the foodstuff is near its freezing point. To establish a standard for tests the foodstuffs are first cooled to 32° F. and the time taken to compare different methods of freezing has

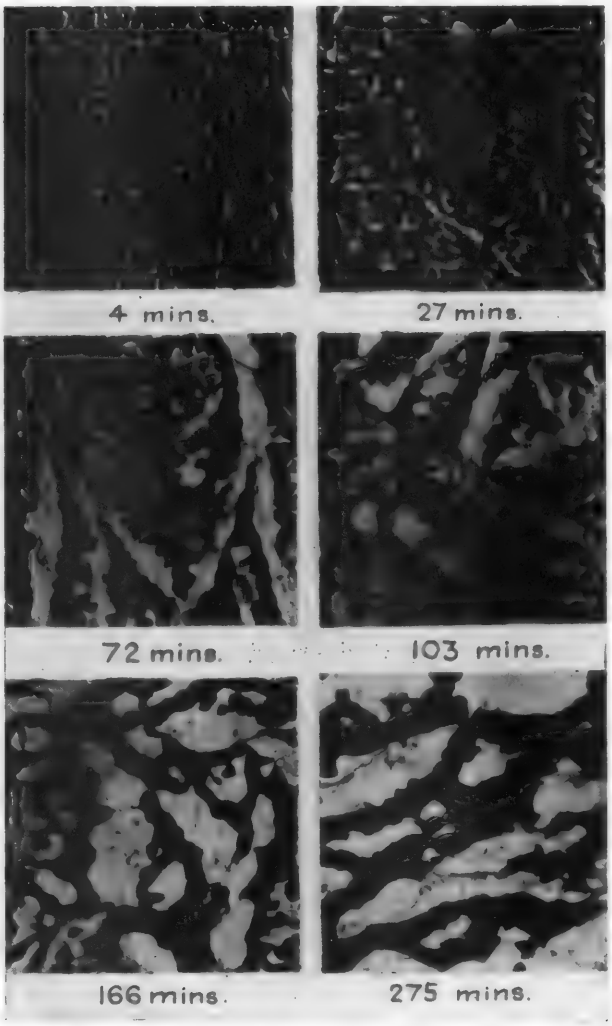


FIG 2.—**The structure of muscle frozen at different rates.**

[*This and the illustration* (*Fig.* 3) *on the opposite page are reproduced from the Food Investigation Board's Annual Report of* 1931, *by kind permission of His Majesty's Stationery Office.*]

therefore been taken as the time to cool from 32° F. to 23° F.; it is called the "critical time".

It is obvious that the time to cool the centre of a body depends upon the thickness of the body. The critical time is a function of the critical thickness which is the depth at which structural alterations due to freezing begin to be so marked as to impair the quality of the foodstuff.

Rapid Freezing

Rapid freezing is, in practice, carried out in air at low temperatures or with brine. Sodium chloride brine is used in systems in which the brine comes into contact with the foodstuffs, as in the case of fish, but this brine cannot be cooled below −4° F. in commercial plant. Calcium chloride brine, cooled to −40° F. and lower, is used in systems in which the brine does not come into direct contact with the foodstuffs. The rate of cooling and freezing varies greatly under the different conditions, as shown in the following table:

Method of Cooling.	*Time to Cool and Freeze Beef-cut 1 in. Thick 32° F. to 25° F. in the Centre.*
Still air at 0° F.	97 minutes
Rapid-moving air at −15° F. ..	62 ,,
Rapid-moving air at −60° F. ..	32 ,,
Moving brine at −4° F.	38 ,,
Moving brine at −35° F.	22 ,,

Fig. 2, reproduced from the Food Investigation Board's Annual Report of 1931 (work on the freezing of meat carried out by T. Moran), shows six micro-photographs of the ice formation in beef, with the times taken in each case to reach 23° F. The practical importance is the thickness of meat which can be frozen within the critical time, as this limits the size of the meat-cuts marketed in containers. The thickness depends on the method and temperature of freezing as shown by the following table:

Meat-cuts Packed in Rectangular Waxed Cardboard Boxes.	*Critical Thickness.*
Frozen in moving air at −15° F., the boxes placed on racks in the freezing room ..	1·2 ins.
Frozen in brine spray at −4° F.	1·8 ,,
Frozen in moving air at −15° F., the boxes placed on plates in contact with brine at −35° F.	2·2 ,,
Frozen in moving air at −60° F.	2·5 ,,

Fish Freezing

A very small proportion of the fish caught is frozen at sea. Fish frozen on board ship is frozen whole; there is no space available for the large personnel which would be required to fillet and package the fish. The freezing methods in use are direct immersion in brine or brine rain and spray. The varieties frozen are halibut caught off the north-west coast of Greenland, salmon caught north of Japan and a variety of fish caught off the north-west coast of Africa.

Various kinds of fish are frozen on land, mainly in "sharp freezers", in which the fish are spread out on metal trays placed on cooling pipes. Filleted fish is packed in waxed cartons and frozen in air at low temperatures by brine rain, brine spray, or indirect contact with brine according to a multitude of mechanical systems evolved as used for freezing meat in cartons.

The observations regarding critical time of freezing and critical thickness mentioned for meat apply also to fish.

There is a great divergency in the structure and composition of different kinds of fish-flesh and a marked difference in behaviour during freezing, needing particular attention and treatment. White fish like halibut is found to be in excellent condition of preservation after six or more months' storage if frozen in brine at −4° F. and stored at −10° F. with finely crushed ice sprinkled between the fish excluding all air. No rancidity or rusting has been observed under those conditions. In the case of brine-frozen herrings stored for six months at −18° F. rancidity was observed in the flesh near the skin; it was found that this was mainly due to salt penetration from the freezing brine. With a view to overcome this and in order to freeze rapidly enough, tests are now

being carried out under the writer's supervision on the freezing of herring in a fast stream of air at −60° F.

Storing Frozen Flesh Foods

The beneficial effect of rapid freezing can only be preserved by storage at sufficiently low temperatures. This has been shown in experiments with meat, for instance, which proved that if rapidly frozen and then stored at higher temperatures in the range of 26° F. to 30° F. the originally small ice crystals decreased in number and increased in size until finally the resulting structure was little different from that of meat frozen slowly at 26° F. to 30° F. with, on thawing, the same large quantity of drip and loss of flavour. Fig. 3 shows clearly the alterations in size of the ice crystals (reproduced from Report by T. Moran, *ibid.*). The same type of changes were observed in fish in similar experiments.

Rapid-frozen meat should be stored at temperatures of −8° F. to −10° F., and fish preferably at −18° F.; fluctuations in temperature have to be avoided.

Although the air at these low temperatures has a very small capacity to hold water-vapour, desiccation of the surface of foods is in some cases appreciable. This trouble shows itself as a discoloration and toughening of the outside layers of the foodstuffs, and is known in the trade as "store burn".* The excessive desiccation is mainly due to the absorption of water from the foodstuffs by the wrapping paper and the packing material, and from the air by the cooling pipes, these being several degrees lower in temperature than the air. The absorption of moisture by the packing material is appreciable; it has been found that in the case of frozen poultry stored in wooden boxes lined with vegetable parchment paper, after six months' storage, the boxes and paper had absorbed 0·45 oz. of water per 1 lb. weight of packing material. A remedy has now been found consisting in wrapping the foodstuffs in material which is impermeable to water-vapour, such as aluminium foil covered on each side with waxed paper.

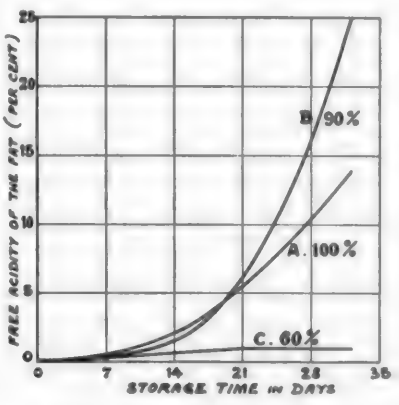


FIG. 4.—The effect of humidity of the atmosphere on the growth of micro-organisms on bacon fat in air at 59° F. A, Air at 100% humidity: Fat covered mainly with yeasts. B, Air at 90% humidity: Fat covered mainly with moulds. C, Air at 60% humidity: No visible growth.

* See "Store Burn in Frozen Meat and Poultry", by T. Moran and N. L. Wright, FOOD MANUFACTURE, October, 1937.

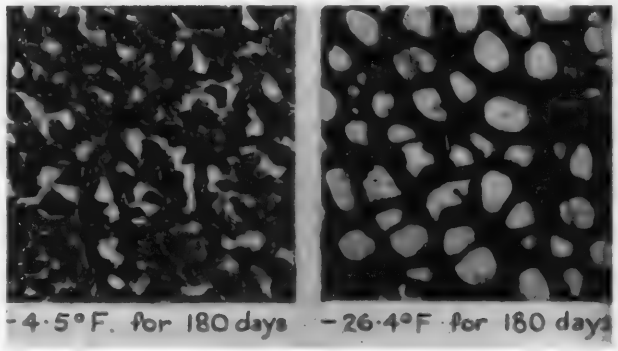


FIG. 3.—Examples of muscle frozen rapidly and stored at the temperatures shown for the period of 180 days.

Storing Chilled Flesh Foods

Chilled foodstuffs are very liable to deterioration in quality, due to a multiplicity of causes, some of which are:

(*a*) The air humidity of the store:

If too low, it induces desiccation of the foodstuff with consequent discoloration of the surface layers and dryness in taste;

If too high, it induces mould growth, decomposition by micro-organisms and yeasts, which cause taint and rancidity.

(*b*) Infection during killing and handling caused prior to storage, which during storage induces the growth of micro-organisms, moulds, slime and taint by the action of which changes in colour, rancidity, etc., result.

(*c*) Rancidity caused by atmospheric oxidation, by absorption of foreign odours and the action of light.

Mould growth, the development of micro-organisms, with consequent rancidity and taint, can be prevented or retarded by the addition of percentages of carbon dioxide to the storage atmosphere, or by the addition of percentages of carbon dioxide and nitrogen and the reduction of the proportion of oxygen to a percentage lower than that normally present in air. The critical dosages differ for practically each foodstuff; excess of the critical percentage may be the cause of damage, such as the discoloration of the surface of meat, the bleaching of the skin of pork, etc.

Egg Treatment

The use of these gases is beneficial in the case of foodstuffs which devaluate in market price due to evaporation, such as eggs in shell. The evaporation is minimised if eggs are stored at high humidity, but mould growth appears if a humidity of about 84 per cent. is exceeded at 32° F. storage temperature. Eggs can be stored in a saturated atmosphere without mould growth developing if the storage atmosphere is a mixture of carbon dioxide and nitrogen; eggs thus stored are practically as good as fresh eggs in all respects after seven months' storage and longer. The construction of such gas stores and the method of cooling have to be of special design.

The addition of carbon dioxide to the storage atmosphere has been found to prolong the storage life of bacon, pork, poultry, etc.

Fruits and Vegetables

Frozen fruits can be used—

(*a*) In the frozen state in fruit salad, fruit ices, etc.
(*b*) For cooking (stewed fruits, for tarts, etc.).
(*c*) For canning when fresh fruits are out of season.
(*d*) For jam making when fresh fruits are out of season.

Frozen vegetables may be cooked and served in the same way as fresh ones.

No foodstuff improves in quality by freezing and storage nor by any other method of preservation, therefore the initial quality of fruits and vegetables intended for freezing must be of the best. Fruit should be tree-ripe, in sound condition, graded, sorted, and should reach the freezing room or be blanched or treated with sugar or syrup within the shortest possible time after picking. The same applies to vegetables, which should be washed, have the inedible parts removed and should be prepared as they would be for the table or for canning.

Fruits and vegetables initially are living things. They are no longer alive after freezing and on thawing show considerable chemical and physical changes which rapidly bring about alterations in colour and flavour. These changes are not, however, apparent if the material is consumed or used within a very short time after thawing or, in the case of some fruits, if consumed in a partly thawed condition. Certain varieties of the same kinds of fruits are found to yield a better product after freezing than others.

The freezing should, in general, be reasonably rapid; obviously the rate of freezing depends on a number of factors, as mentioned in the paragraph on "Freezing" above. Freezing temperatures of brine at −4° F. or moving air at −15° F. are found suitable for most fruits and vegetables, followed by storage at −5° F. to −10° F. Pre-cooled fruit and vegetables will freeze more rapidly than if they are at room temperature.

The storage temperature for the already frozen material affects the flavour and colour. Strawberries, sweet cherries, plums, peas and runner beans require lower storage temperatures than other materials.

Autolytic Changes

Autolytic changes occur in the freezing of certain fruits, strawberries for instance, resulting in discoloration and changes in flavour. Oxidising enzymes are responsible for the discoloration of the cut surfaces of sliced fruits. The covering of the fruit with sugar or syrup will greatly retard these actions; blanching will prevent them in the case of some fruits and vegetables; and further preventive treatments are the storage of the materials in containers from which air is excluded, in nitrogen or a controlled amount of sulphur dioxide.

The water used for cooling fruit or vegetables after blanching should be cooled or chilled, and the syrup subsequently added should be chilled.

The following gives a brief outline of the practical procedure in freezing, for a few fruits and vegetables.

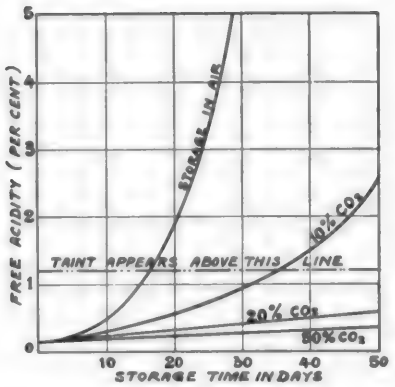


FIG. 5.—The effect of carbon dioxide in retarding the growth of micro-organisms (tainting) in beef fat at 32° F. and 100% relative humidity.

Fruit Treatment

Strawberries and **Raspberries** keep their aroma and flavour best if frozen in syrup. Better appearance and flavour are obtained with syrup of 50 per cent. strength than with lower strengths. The best results have been obtained by rapid freezing in brine at −50° F. and subsequent storage at −50° F. The maintenance of such low temperatures is too costly. Very good results are obtained when freezing in brine at −4° F., followed by storage at −5° F. to −10° F. Good results are obtained by freezing in air at −5° F. to −10°F., but the temperature of the freezing room must not rise above −5° F. during loading and the subsequent storage must be at −5° F. to −10° F.

On thawing there is an appreciable "drip" or "leak" from strawberries and raspberries even when frozen and stored at temperatures of the order of −50° F. or lower, but leakage is only about 3·5 per cent. greater when the fruit is frozen and stored at −5° F. Leakage will not be noticeable if the fruit is eaten in the half frozen condition or if immediately after thawing it is crushed for use in sundaes, for example.

Plums are found to undergo considerable changes in the frozen state; most varieties turn brown and become sour after thawing. These tendencies can be prevented by:

Boiling the fruit in sugar syrup for about five minutes, cooling rapidly and then freezing, or

By freezing in syrup but cooking immediately after the fruit is taken out of the store.

In either case, however, the fruit is in no way superior to canned fruit.

Browning and sourness are not noticeable in frozen plums consumed in a partly thawed condition. Freezing and storage are carried out at the same temperature as for strawberries.

Cherries darken during storage in the frozen state due to active oxidase systems, and rapidly undergo further changes on thawing. Sweet cherries, especially the lighter-coloured varieties, are even more susceptible to these changes. These tendencies are minimised by treating the fruit in the same way as plums.

Browning can be overcome, in the case of cherries and

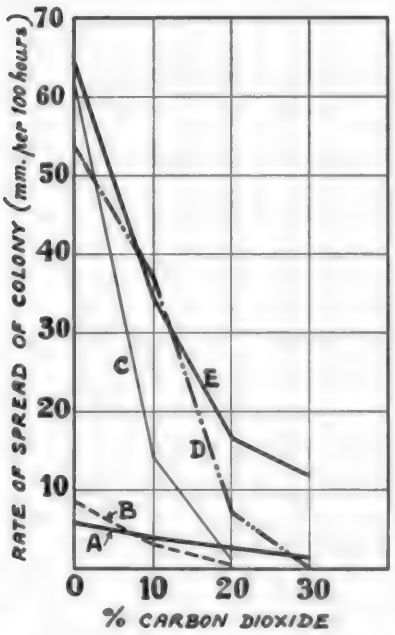


FIG. 6.—The rates of growth of food-attacking fungi at various carbon dioxide concentrations at 50° F. A, Sporotrichum carnis. B, Cladosporium herbarum. C, Thamnidium elegans. D, Thamnidium chœtocladioides. E, Mucor mucedo.

plums, by freezing in vacuum and excluding the air during thawing, but the fruit has to be cooked immediately on thawing.

Treatment of Peas

With **Peas,** blanching is necessary with boiling water, for as short a time as compatible with the destruction of the enzymes. Blanching for 1¼ to 1½ minutes has proved to be sufficient for this purpose, provided the water is kept at boiling point all the time. The addition of 0·1 per cent. of anhydrous soda to the blanching water helps softening, preserves colour and stops wrinkling of the peas. Periodic addition of soda is required to maintain the correct strength. The peas are then shot into chilling water, then on to a travelling belt where they are sorted for splits, empty skins, yellows, etc. The peas are then packed dry in waxed cartons lined with Cellophane. This combined type of packing prevents desiccation during freezing and storage.

Some varieties preserve better if packed in tins or waxed cylindrical cartons, the peas being covered with water to which 0·1 per cent. of soda is added.

An appreciable degree of infection takes place during shelling, handling, etc., which is not destroyed in the blanching. Rapid freezing after the peas are packed will arrest the spread of the infection. Subsequent storage at −5° F. to −10° F. is recommended.

Other Vegetables

With **Asparagus,** blanching in boiling water gives better results than blanching by steam. The "grass" is then rapidly cooled by chilled water and packed into tins with a 1 to 2 per cent. brine. Better results, as regards colour and texture, are obtained by rapid freezing of the tins in brine at −4° F. than by slower freezing in air, and by subsequent storage at −5° F. to −10° F.

Runner Beans are treated in the same way as peas. The blanching is done in boiling water for five minutes; the freezing and storage in the same way as peas.

Rhubarb keeps well when frozen without a covering liquid and stored at 10° F.

Rapid Freezing Methods

Liquid mediums such as brine remove the heat from a body at a quicker rate than gaseous mediums such as cold air or vapourising solid CO_2.

The use of brines has certain disadvantages when the brine comes into direct contact with the foodstuffs, the main one being slight salt penetration resulting in a pronounced colour change in the case of meats, and in the case of oily fish, such as herring, the salt penetration is one of the causes of rancidity during subsequent storage. On the other hand, large white fish such as halibut and cod are frozen successfully by direct immersion in sodium chloride brine.

When gauging the merits of a method and especially of a mechanical system of freezing, consideration must be given to the kind of foodstuff to be frozen; the size and shape of the individual articles or package; the quantity to be dealt with per hour; and the location of the plant. For instance, a plant suitable to deal with large halibut is not suitable to deal with thousands of small fish like herring, and a plant erected for freezing fish at a port will in all probability be unsuitable for use on board ship. Similarly, a plant dealing with the freezing of a few hundredweight of peas per day may work out to be very uneconomical if enlarged to deal with a few tons of peas per day, and the same type of plant will in all probability be unsuitable or very uneconomical if it were used for freezing poultry.

Further, the type of refrigerating machine, the type of condenser, the type of evaporator and the actual method of cooling are all factors not only influencing the efficient freezing of the foodstuffs but also the economic running of the complete installation.

American Frozen Foods
(concluded from p. 84)

and purchases must be made for fairly immediate requirements.

(*c*) Differences in appearance and handling cause consumer hesitation.

(*d*) Pending technical developments in fresh produce and meat fields might place frozen foods at still greater disadvantage.

Favourable Influences

Frozen food processes and products are still in the stage of an infant industry. Improvements will be continuous and far-reaching in the next few years. Both quality and safety will be greatly improved. If technical developments also reduce costs, frozen food volume may increase importantly. (*From "The Canner".*)

Refrigerated cabinets, such as the one illustrated — which was made by the Russ Soda Fountain Company for Honor Brand Frosted Foods—afford point-of-sale advertising for the products, and ensure efficient handling and storage at proper temperature.

The POSSIBILITIES of FROZEN FOODS in RETAIL STORES

An American View

RECENTLY THE Cincinnati Testing Laboratories completed a survey on the use and possibilities of frozen foods in retail stores for one of its clients, an important distributor of canned and other foods. Although many canners, as such, are not keenly interested in the retailing of frozen foods, some will find the report worth their attention.

Since a number of canners are already freezing vegetables and berries and since others are finding that frozen foods compete with their packs, it is significant to find Mr. C. L. Arnold, who made the survey, suggesting to retailers that they make some sort of start in handling frozen items. He says that no large volume of immediate sales should be expected, but frozen foods have a novelty and advertising appeal of some value to-day.

Mr. Arnold lists the three leading processes as follows:

(*a*) Birdseye, subsidiary of General Foods Corporation, is the outstanding leader not only in priority but in development of the field, and in the opinion of many has given more thought to improving quality and safety angles of the merchandise. This company promotes its own merchandise on a branded basis.

(*b*) Honor Brand Corporation served the institutional field rather than the retail exclusively until this year; it is now expanding in the retail field. Has no freezing process of its own, buys from various freezer operators.

(*c*) Z process. This process has some technical advantages and some disadvantages compared with Birdseye Process. The Z direct spray process has been under different managements for several years. It is now managed by Charles H. Welling Company. They are at present interested only in selling their patented manufacturing processes, are not doing any freezing themselves for retail consumption except through the licensing of their processing equipment to packers and producers.

Approximately one-third of Birdseye volume is marketed through institutional channels—hotels, restaurants, hospitals, etc. This has been its most easily developed field and has naturally forged ahead faster.

Retail Status

Between four and five thousand stores now handle packed frozen foods, chiefly in New England and the Middle Atlantic states. Three-fourths of the total are outlets for Birdseye brand.

Some few stores average several hundred dollars a week volume, but general average for Birdseye outlets is around $62.00 per week per store at retail. Birdseye considers $50.00 per week at retail fairly satisfactory, as it produces around $40.00 per month profit for the retailer. General trend of volume in the past two years has been slowly upward.

Frozen Food Acceptance

Growth of frozen food volume has been slow, and is still definitely in the luxury item class. Volume growth may be accelerated somewhat in the future, but it will be a good while before this volume becomes imposing.

One of the big disadvantages in frozen foods from the retailer angle is that the consumer apparently must pay a higher price. Actually, this high price is largely accounted for by the fact that all waste material is removed from the product before it is packed.

Technical objections could be found. Under certain processes, the products are packed in a loose state which has the advantage from the customers' angle of easier acceptance and usage, but is apt to have the technical disadvantage of picking up bacterial infection in the course of handling through distributing channels.

Retarding Influences

(*a*) Cost already mentioned; comparatively few housewives educated to consider savings in time and waste material.

(*b*) Many homes not equipped for frozen food storage

(*Concluded on previous page.*)

COLD for SALE

by

T. Crosbie-Walsh, F.I.C.

THE PRODUCTION of low temperatures has become one of the most important cogs in the machine of modern civilisation. Suddenly to stop interfering with the thermometer would be to disorganise the food supply of millions of people.

Not only is cold used directly (as in cold stores) but indirectly. That is to say, ice is made first and constitutes a mobile source of cold.

The large cold storage concerns kill two birds with one stone. They run cold storage chambers and also make solid ice, using the same plant and machinery for the two things.

A fine example of such a plant is the Shields Ice and Cold Storage Company's works at North Shields. It is situated on the quayside, at which, in the season, a procession of trawlers hungrily tie up and into whose maws pours a steady supply of crushed ice direct from the works. Once in the holds of the trawlers, the manufacturer's work is done.

The Engine Room

It starts in the engine room. This houses two Sterne Mark 3Y10½ high-speed, totally enclosed vertical ammonia compressors, each coupled to synchronous induction motors running at 365 r.p.m. and having a capacity of 80 tons per day.

Eight horizontal shell-and-tube condensers condense the ammonia handled by the main machines. To avoid any interruption of the work these condensers may be cut out singly, when necessary, for cleaning purposes.

Every item of the plant is so arranged as to render impossible any breakdown which would interfere with the temperature of the cold storage chambers or the ice tanks.

The constant flow of cooling water for the condensers is handled by two centrifugal pumps, direct coupled to electric motors. One of these pumps is sufficient to perform all the work and the second one is always available as a standby.

For the motors, high tension current at 5,500 volts is taken in and reduced to 440 volts. There are three lines running in from the central power station—one direct from the station to the plant, and the other part of the line supplying the town, the third being a low power supply which is used for cold storage only.

Electrical Control

The automatic control of the electric current is very ingenious. In the cold season, from October to February, an automatic trip shuts down the main current supply at 3 p.m. A horn sounds at 2.45 to advise those concerned. There is a constant supply of 43 kw. per hour. Another automatic device rings a bell which indicates when excess power is being taken and enables the electrician to reduce the power within the limits.

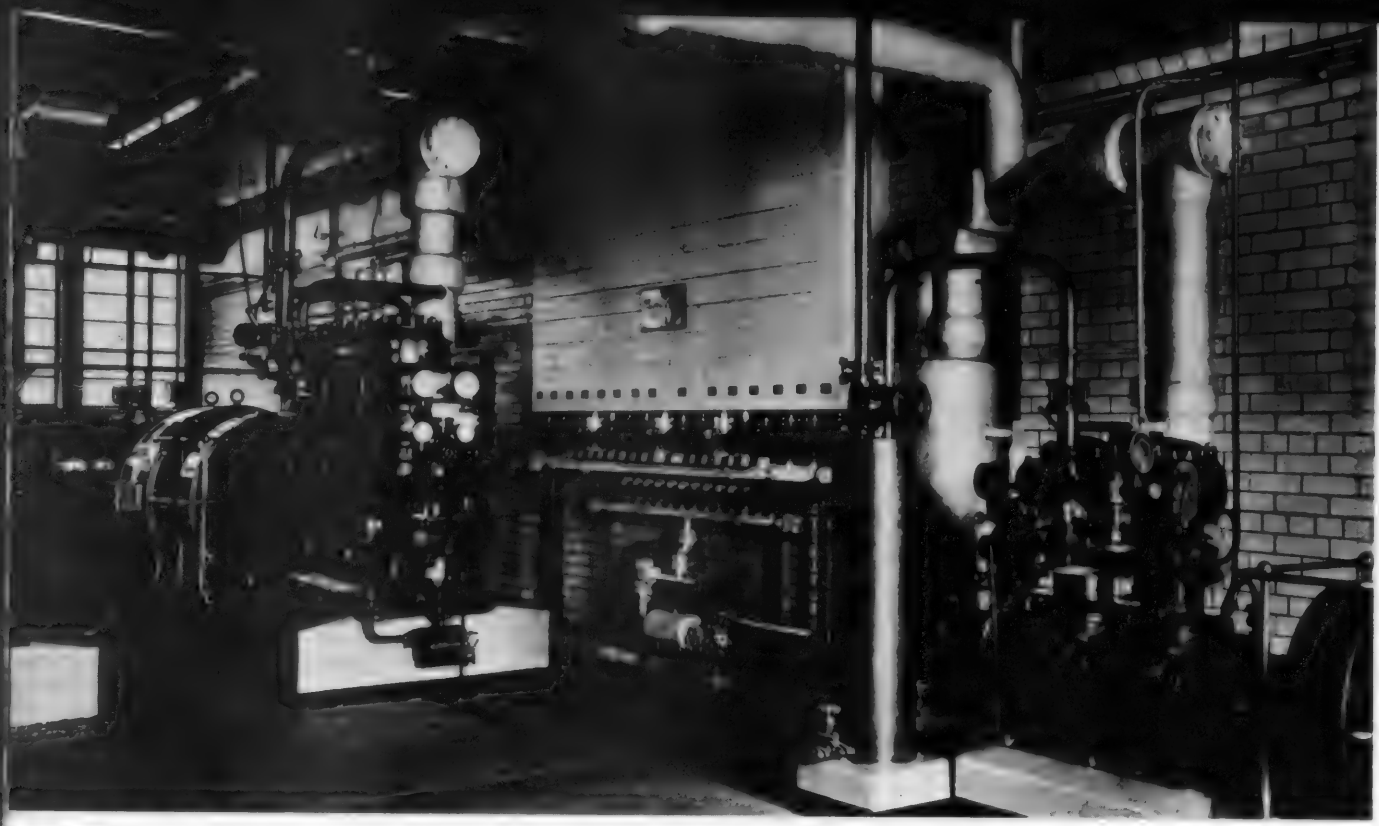
The pumps run at 1,455 r.p.m. and have a capacity of 1,100 gallons per minute. A small pump comes into action when ice is not being made and the cold stores only have to be maintained.

For the cold storage chambers there is a separate refrigeration plant, consisting of a Sterne Mark 2W7½ high-speed compressor, direct-coupled to a slip-ring motor, with its own shell-and-tube condenser and water circulating pump. This separate installation is used when the ice making plant is not working. When the latter is working, the cold storage installation is connected with it.

The Ice Tanks

The huge tank room, where the brine is cooled, occupies most of the first floor. There are two ice tanks, each

This view of the ice works shows the quay and (on the left) the method of delivering ice to the trawler.



The top picture shows the engine room at the ice works. The picture on the left gives an unusual and fully descriptive view of the worm type conveyor for crushed ice which stretches from the main building, right over the quay to the water's edge. The bottom picture is of the spacious ice tank room, reminiscent of a huge hold in a cargo steamer.

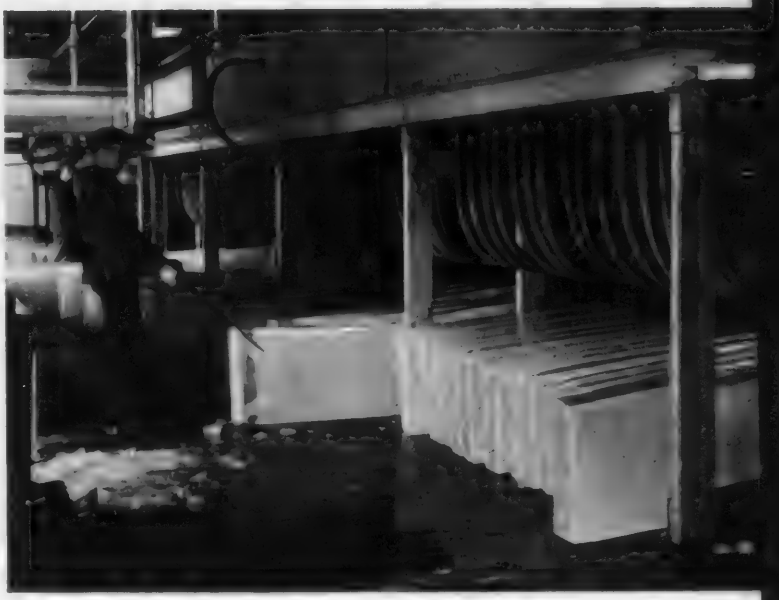
of which has a capacity of 960 ice cans, which each hold 2 cwt. of ice. The covers of the tanks are level with the floor, giving the room the appearance of a vast empty space when the covers are in position. The maximum capacity of the ice tanks is 150 tons in 24 hours.

The ice cans are filled by an arrangement which automatically fill a complete row of cans at one and the same time.

The brine in the tanks is cooled by two horizontal single-pass shell-and-tube coolers, and is circulated by high-speed motor-driven propellers.

The ice cans are carried by travelling cranes (one for each tank) which lift 6 tons of ice at a time, corresponding to 60 blocks. Having emerged from the tanks, the cans are lowered into a thawing tank. Slight thawing of the ice where it touches the sides of the cans is necessary in order to facilitate emptying them.

The heat for the thawing tanks is supplied from a boiler or from a heat exchanger in the boiler room. Copper coils in the tanks conduct the hot water for thawing.



Discharging the solid ice blocks from the cans.

The Ice Crushers

Having been removed from the cans, the ice is fed into crushers, of which there are three, each having a capacity of 30 tons of ice per hour. From the crushers the ice is supplied direct to the trawlers by means of worm conveyors.

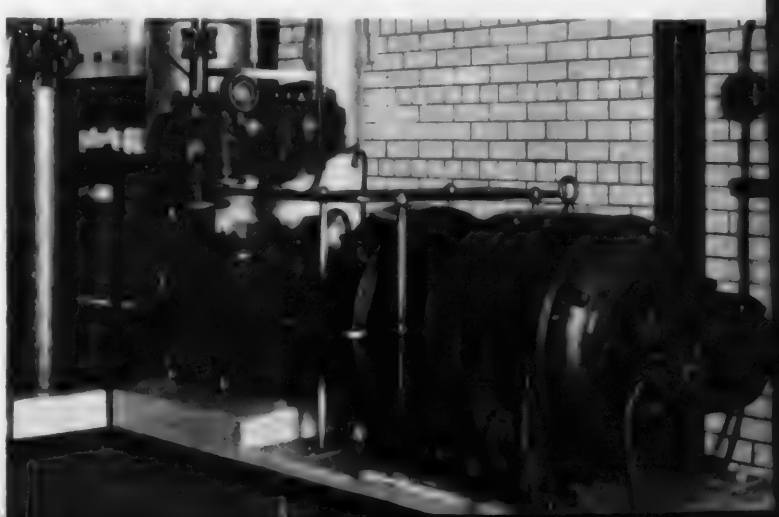
For delivery into carts for despatch as blocks, there is a special chute which runs from the tank room to a platform on ground level, from which carts are loaded for town use.

For making clear ice, special nozzles are fitted to the cans, by which purified refrigerated air is passed into the water and agitation effected during the first hours of freezing.

The water from which the ice is made is filtered prior to being frozen, the supply being of a peaty nature. Constant colorimetric tests are made in order to control filtration and ensure a colourless supply.

In the tank room is a cold store for holding stocks of ice. This is useful when delivering small orders and obviates the necessity for handling the huge cranes.

Above are shown the thawing tanks and below is seen the motor for the separate refrigeration plant for cold storage chamber.



Cold Storage

The cold store chambers are eight in number and are situated on the ground floor, conveniently situated by the quay. The total capacity of the chambers reaches approximately 80,000 cubic feet. A great variety of produce is stored, the principal items being meat, poultry, fish and butter.

The temperature of the ice tanks and of the separate cold store chambers is indicated by twelve long-distance thermometers fitted to a panel in the engine room.

The thermometers are easy to read, as may be imagined by their bore of $\frac{5}{8}$ inch and their length of about 3 feet. They are also very quick-acting, which is an advantage when rapid adjustment is desired. The necessary valves for adjusting temperatures at any given point are placed immediately below the thermometers.

The FREEZING and COLD-

by A. BANKS, Ph.D.(Liv.), A.I.C., of the Torry Research Station, Aberdeen

HERRING APPEAR in shoals in great numbers round the coasts of Britain during summer and autumn. These herring have a high content of fat and are of excellent quality. During winter and early spring there is not such an abundance of herring, and those caught are lean and not of such good quality. Yet, since the price largely depends on supply and demand, it is usual to find that the former realise less than the latter. Means of spreading the abundant summer and autumn supplies over the whole year are therefore generally beneficial.

In the past it has been customary to accomplish this by curing with salt, and to-day large quantities are still treated in this manner for home consumption and for export, although in recent years the demand for salt-cured herring has fallen off to a great extent. The practice of canning herring in various ways has, however, grown a great deal.

Cold Storage

With the realisation that bacterial spoilage is arrested at low temperatures, efforts have been made to perfect the cold storage of fish. But, although bacterial growth is easily inhibited, other changes, namely, denaturation of proteins, formation of "drip", and development of "off" and "cold storage" odours and flavours can take place in fish in the frozen condition, and must also be taken into consideration. Nevertheless, the conditions for the successful storage of white fish have been defined. Briefly, it is necessary to employ some method of rapid freezing, *e.g.*, freezing in circulating sodium chloride brine at −20° C., followed by glazing* and storage at −20° to −30° C. Apart from some slight change in appearance, white fish stored at these temperatures remain, from every practical point of view, equal to freshly caught fish for at least six months. In fact, lemon soles have been stored at the Torry Research Station for two years at the lower temperature and have still been in a highly palatable condition. Preliminary experiments have shown that these conditions also apply to the herring, except that, under certain conditions, it is, owing to its fatty character, specially prone to develop rancidity.

* "Glazing" is the term given to the process by which fish are covered with a film of ice. A glaze can be formed by dipping the frozen fish in water or by spraying. It was originally used to prevent undue desiccation of the fish, but with herring it has been found to have other advantages too.

Fat Condition

Detailed examination of the condition of the fat in the herring has been carried out. In one series two types of herring were examined, early summer herring caught off the north-east coast of Scotland and early spring herring caught in the Firth of Forth. The herring were frozen singly in air and stored, glazed and unglazed, at −20° and −28° C., and frozen in sodium chloride brine and stored, glazed and unglazed, at the same temperatures. The effect of stowage in ice prior to freezing and storing was also examined.

At monthly intervals sample fish were thawed, cooked and tasted, particular attention being paid to the flavour of the lateral brown streak of muscle, and the condition of the fat extracted from this part of the herring was examined by determination of the content of peroxide oxygen and by the Kreis test.

These experiments have shown that herring can be stored at −28° for longer periods without development of rancidity than at −20° C.; that glazing retards the development of rancidity, particularly if the fish have been frozen in brine; and that rancidity develops more rapidly if the conditions of storage are such as to permit extensive desiccation.

Engine Room at Torry Research Station. Two double phase ammonia refrigerators are alternately used for maintaining store temperatures. The machine in the foreground is a smaller ammonia compressor, used exclusively on the brine freezing plant.

STORAGE of HERRING

Influence on Rancidity

The most interesting feature observed, however, was the accelerating influence of brine freezing on the development of rancidity. The fish frozen in air generally became rancid at a later period of storage than the brine-frozen fish. This general effect was more marked in lean than in fatty herring, and it is supposed that, owing to the greater content of fat, there is less penetration of brine during freezing in summer herring than in winter herring. Fatty herring, frozen in air, well glazed and stored at −28° C., were of excellent flavour at the end of five or six months' storage. Similar herring, frozen in brine, glazed and stored at −28° C., although not rancid, were not quite so good, having lost the sweet flavour associated with fresh herring.

Stowage in ice prior to storage has an adverse effect. Herring that have been a day or two in ice prior to freezing develop a stale and unpleasant flavour in a month or so, irrespective of the methods of freezing and storage used. This flavour increases with further storage, rendering the fish most unpalatable.

The effect of brine-freezing, glazing, etc., seemed to indicate that some other factor than direct atmospheric oxidation of the fat is responsible for the rancidity occurring in certain cases. This was shown to be true when experiments on the oxidation of herring oil at low temperature were carried out. It was found that there is a marked retardation with lowering of temperature, that covering the oil with a film of ice practically eliminates atmospheric oxidation altogether, and that common salt has absolutely no effect on this type of oxidation. If all these points are considered, little development of rancidity would be expected in the fat of frozen-brine herring that had been well glazed and stored at −28° C. This conclusion is not, however, in agreement with the experimental evidence, and it has been discovered that this discrepancy is due to the presence of an enzymic system, able to promote rancidity, in the lateral brown streak of muscle. This system is activated by small concentrations of common salt.

Precautions Necessary

It is obvious then that the use of brine-freezing will introduce a secondary factor which may prove detrimental to the keeping qualities of the herring. Unless particular care is taken, rancidity will develop rapidly during storage. In other respects well-stored, brine-frozen herring are equal to fresh. The texture and flavour of the flesh is good, and the herring make excellent kippers, with only a slight increase in the number of "seconds" as compared with the original fresh fish. The use of brine-freezing for the commercial storage of herring will therefore depend on how far the onset of rancidity can be prevented. An efficient method of washing the fish after brine-freezing would be necessary. The method used for these experiments has consisted of spraying the fish in bulk with tap-water from a hose, and has given variable results, *i.e.*, brine-frozen, glazed herring from the same batch have developed rancidity at different times during cold storage. If a means is devised that will give effective washing without causing too great a rise in the temperature of the fish, brine-frozen herring should remain free from rancidity for at least five months at −28° C.

Air Freezing

Air freezing, so far as the experiments have shown, produces an article very little different from the fresh herring in flavour, provided the fish are well glazed. After some months' storage, herring that have been frozen in air at the storage temperature (−20° to −28° C.) will be slightly inferior to brine-frozen fish in the texture of the flesh and ability to make a smoky cure, although it is possible that these differences are so slight as to be of little practical importance. In air freezing, care would be necessary to prevent too much desiccation, and glazing would be essential.

From the practical point of view, brine freezing has attractive features not possessed by air freezing. It is economical, compact and capable of being carried out in

Instrument Room at Torry Research Station. Each panel carries the terminals of six thermo-electric circuits for the determination of temperatures in various cold stores.

many ways. The small plant in use at the Torry Research Station makes use of the "batch process", and is able to freeze ½ cran of herring to a temperature of −20° C. in 40 to 60 minutes. Air freezing seems more difficult to adapt to individual requirements, and since the rate of freezing in air is only about one-fifth the rate in brine, very cold air is necessary to obtain a rate of freezing comparable with that in brine at −20° C. The rate of freezing has two important aspects.

Firstly, certain changes in the structure of fish's muscle take place at a maximal rate between −1° and −5° C., and the time spent during freezing between these temperatures must be as short as possible. The times taken to reduce the temperature of herring, 1 inch thick, from −1° to −5° C. are approximately as follows: Freezing in brine at −20°, ¼ hour; freezing singly in circulating air at −30°, 1½ hours; freezing singly in circulating air at −20°, 7 hours; and freezing singly in circulating air at −10° C., 10 hours. Fish frozen in these various ways differ somewhat in texture and ability to make a good smoke-cure; brine-frozen fish are the best in these respects, there being a gradual adverse change with lengthening of the time of freezing.

Glazing Essential

Secondly, since glazing is essential and since this operation may raise the temperature of the fish about 5 or 10 degrees they must leave the freezer at a temperature not higher than −20° C. The times taken to reach this temperature with the various types of freezing are roughly as follows: Freezing in brine at −20°, 1 hour; freezing singly in circulating air at −30°, 2 hours; and freezing singly in circulating air at −20° C., 13 hours. It is obvious that freezing in air at −30° is far better than freezing in air at −20° C., and that if herring are to be frozen on a large scale, freezers using air at −30° would have to be much larger to freeze a given quantity of fish in a given time than those using brine at −20° C. The use of air at a slightly lower temperature, such as −35° C., would be advantageous, but in any case air freezing is useless unless the herring are frozen singly, that is, spread out on trays or on moving belts. Freezing in bulk, *e.g.*, in boxes, must therefore be avoided. Other methods of freezing without contact with brine, such as by contact with cold plates, might be considered.

Choice of Herring

The choice of herring to be stored is of importance. By far the best results will be obtained with herring not more than 12 hours out of the sea,* but herring 36 hours from the sea are useless, since they soon develop a stale flavour. The various classes of summer and autumn herring also differ in texture, and react differently to storage at low temperatures; for instance, Fraserburgh July herring are more suitable for storage than the June herring, and it appears that the herring that make the best kippers, with very few "seconds", are also best for storage at low temperatures.

* Provided that icing at sea is employed, it is possible that "day-old" herring could be used with success.

(*Continued on page* 93.)

(Left) Experimental Brine Freezing Plant at Torry Research Station. The cage filled with herring is lowered into the tank of cold circulating brine beneath.

(Right) Interior of Experimental Cold Store at Torry Research Station, showing boxes of frozen herring.

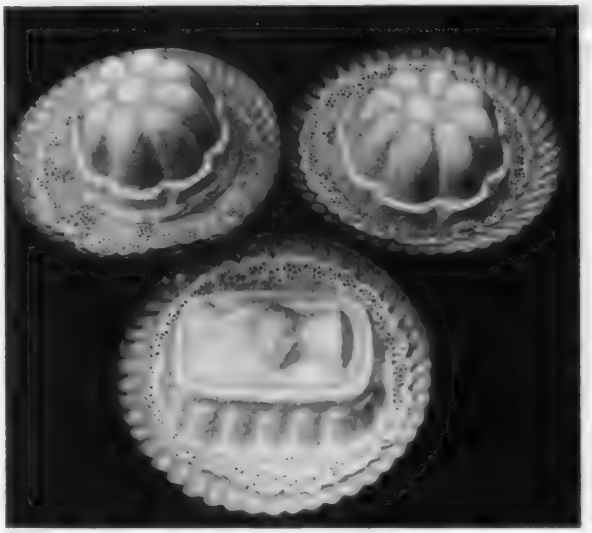
Cooling Confectionery

by

P. S. Jewell, M.A., A.I.C., F.L.S.

and

James P. Hallett (Swansea Technical College)



The two moulded creams at the top were made with a refrigerator. The one in front was made without a refrigerator. The tendency to run and the lack of sharpness is most noticeable here.

OWING, no doubt, to our cool climate, refrigeration has been slow in arriving in Great Britain compared with America, where the refrigerator is almost as common and nearly as indispensable as the cooker.

A case where refrigeration would prove invaluable for cooling a product rapidly to a safe temperature is shown in the case of infection by the *Bacillus mesentericus*, the "Rope Bacteria" of the baker. This organism attacks bread, being unaffected by the baking, and causes the centre of the loaf to darken and finally to draw out into cobweb-like threads when broken apart, while a vile smell develops. Trouble occurs only during hot summer spells when the atmosphere is humid, and then mainly in large loaves which cool more slowly. Reduction of air temperature by as little as 5° to 10° F. is sufficient to cause the attack to cease.

Obstacles to Refrigeration

Unfortunately, the baking trade has been slow to install refrigerators and cooling plants. The product involved is bulky and calls for storage space beyond the scope of ordinary equipment in small bakeries, while handling calls for considerable time and labour. Furthermore, the product is one whose margin of profit is so small that it does not allow of increased overhead charges.

The difficulty arising from the use of the refrigerator for its prime function of preservation has tended to obscure the many other uses to which it may be put in connection with baking and catering in general.

There are many items, both of raw material and finished products, in connection with which a trial of refrigeration would quickly convince the confectioner of its value in his trade. For instance, frozen eggs are utilised to a considerable extent. The use of a refrigerator would mean that these could be ordered in larger quantities, thereby allowing advantage to be taken of bulk prices and reduced delivery charges. Again, the partially used tin of eggs at the week-end (a well-known bugbear) could be preserved in perfect condition.

Most confectioners produce meat pies and savouries. These, when displayed in the window during the summer, soon deteriorate, and yet it is essential to display goods if sales are not to suffer. This difficulty is overcome by the use of modern cold chamber glass cases in which a display of such products and cold meats tastefully garnished with salad can be made, all of which will retain their freshness. It is not too much to hope that the use of this type of case will be extended in the future to cream and chocolate goods such as éclairs. The public do not appreciate such goods when they are soft and sticky as they frequently are under ordinary summer conditions.

Manufacturing Processes

Turning to the actual manufacturing processes, many more advantages come to light. Probably one of the most interesting items which demonstrates the advantages of refrigeration is the type of confectionery now made up and down the country under the name of Danish Pastry. It is a delightful article when properly made, but to do this a refrigerator is essential. One may distinguish with ease the variations in the finish of the goods made under the proper conditions or otherwise, for while both may have similar ingredients the treatment they receive will make or mar them. Danish Pastry should be made from a fairly rich bun dough, made on the straight dough principle. After the first rolling the dough should be placed in the refrigerator for a short rest, the rolling operation repeated, and the dough returned to the refrigerator again. After a short rest pieces may be cut off. The pieces are then rolled out, fillings added, covered with another piece of dough, cut into fancy shapes, and then placed into a dry prover for 30 minutes and baked in a sharp oven at 420° F.

In the manufacture there is a system of layers of dough and layers of butter built up and, as in the case of the manufacture of puff pastry, it is essential that this system should be retained until the oven is reached. If the dough is allowed to remain in the warm bakery the yeast present causes fermentation and the system of layers

begins to break down. At the proving stage the confection, instead of remaining rigid, flows, and the result is a poor shape, but with the temperature reduced up to the short proving period the goods not only keep their shape but the system of layers is retained until the high temperature of the oven is reached. In this way the butter melts in the interior of the bun, segregating the gluten and forming a flaky and light pastry which it is impossible to produce properly unless the steps described are taken. An additional advantage also accrues, for although a large quantity may be made up, it need only be used when required, so that when it is noted that supplies in the shop are required they can be sent down at all times of the day piping hot, which is the condition in which these types of goods should be sold. There is one further important point—the method eliminates "stales" through over-production.

Refrigeration in the cream goods lines is one of vast importance in the summer with this trade, especially since the restriction on preservatives in cream. It is not necessary to send to the shop more than a small quantity for display and direct sale. At the same time, one cannot always be sending to the bakery to ask for goods to be finished off for sale. It means, for the confectioner, a great deal of repetition of the same work at odd intervals which involves added cost of labour. But if the total requirements are completed in the morning the shop need only draw a small quantity at a time; the bulk remaining in the refrigerator. They may be called on at any time and there is no danger of souring taking place.

"Petit Four Glacé"

It is not always recognised in the confectionery trade that the refrigerator has its uses and advantages in the decoration of some of the articles it produces. *Petit Four Glacé* is a type of confection greatly appreciated by the public. It consists of a small piece of genoese with a small blob of marzipan, marshmallow, or butter-cream piped on the top. The whole is dipped into fondant and decorated. The butter-cream top is one which is the least expensive, not only because of the low cost of the ingredients and volume of the article, but because it takes very little time to prepare a large number of bases. The danger with them, however, is that when they are being dipped in the fondant, which is about 95° F., the butter-cream is always soft, and comes off in the fondant, thus spoiling the whole of the confection. This can be eliminated by placing the pieces of genoese in the refrigerator after the cream has been piped on. The cream will set hard and when it is dipped in the fondant it will retain its shape, its coldness soon reducing the temperature of the fondant, causing the effect of its heat to be negligible.

Again, in the decorating room a cooling plant can be of valuable assistance in speeding up delivery of fondant and chocolate goods. On the large scale a long chamber with a travelling band can save a great amount of time. All this type of goods has to be set properly before packing for dispatch; otherwise the cellophane or other cover with which it is finished will adhere to the sides and top, which, of course, is disastrous.

If goods of the *gateaux* type or those just covered with chocolate are placed on the travelling band when they are covered and the band passes through a cold chamber they may be gathered within a few minutes at the other end ready for packing without danger of being spoilt in the packing. It is not so great a problem during the winter period with the chocolate goods, but in the summer, when temperatures of rooms run fairly high through the lack of cooling facilities, these goods have sometimes to be taken off the sale list. There is no need to do this if the facilities mentioned are provided.

These Danish pastries were made without a refrigerator and . . .

. . . these with a refrigerator. Notice here the bolder better shaped product.

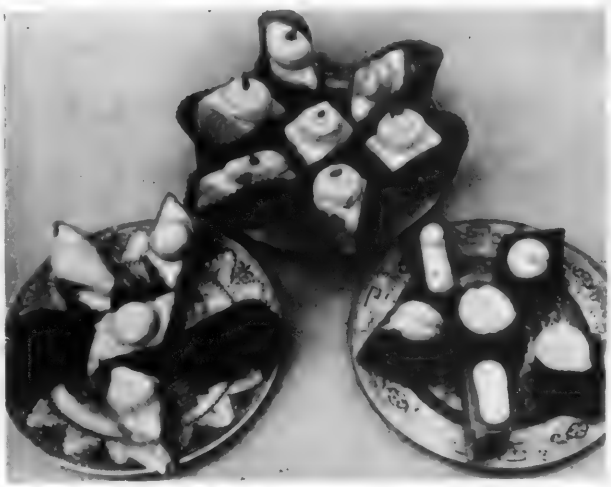
Jellies and Creams

Another line which is now becoming the confectioner's daily work is the preparation of jellies and creams for dances and functions of a similar nature. It is here again that the necessity of a refrigerator becomes obvious in these days of speed and accuracy.

Even plain jellies are better set with a cleaner finish by the use of a refrigerator, but with fruit jellies a cooling system must be brought into play unless considerable time and labour can be expended. Jellies of this type must be built layer by layer, each one being set before the next is added, so that the fruit does not float. Obviously the rapid setting produced by cooling is necessary.

While it is not essential to build up moulded creams in this manner, a refrigerator must be employed to get them to set properly.

After thoroughly cleaning and drying the mould the cream should be whipped, using 2 ozs. of sugar to every pint of cream and adding vanilla flavour, if a white mould is being produced, or flavours corresponding to the colours in other cases. As it is being whipped a little gelatine is added, two leaves of leaf gelatine dissolved in water will be sufficient. The cream should not be whipped so much as is the case when required to form the filling of cream goods or for decorative purposes. When the cream is placed in the mould it should be packed well into all parts and filled to the top. The mould is placed in the refrigerator until service is required. The mould is removed and dipped into boiling water for a minute



Petit Four Glacé **made (at the top) with a refrigerator and (at the bottom) without. Firmness and sharpness characterize the cakes at the top.**

and turned out on the salver. Decoration may be completed with spun sugar. The same applies to moulded ices.

For all types of this work the refrigerator need only be just above 33° F., but for the work of the bomb the refrigerator should be well below zero. The mould or bomb is cleaned and dried, crystallised fruits are soaked in liqueur overnight and the liqueur strained in the morning. The ice-cream, which should be of the best quality for this work, is placed in a bowl and a portion of the fruits cut into small cubes and mixed throughout. The rest of the fruits is cut into various shapes to decorate the moulds. The ice-cream is well packed into the mould, which is then closed with clips. It should then be placed in the refrigerator for at least 48 hours and remain there until just before service. The clips are removed and the mould broken open, the mould or bomb placed on a silver salver and sugar spun over it to decorate it for the table.

Refrigeration Advantages

One may at the moment say that the advantages of refrigeration in the baking, confectionery, and catering trades lie in (*a*) saving in deterioration of raw materials; (*b*) provision of better facilities for production to ensure correct results, saving of time, and production of a wider range; (*c*) saving of loss through perishable manufactured goods going bad; and (*d*) saving of cash in being able to buy in larger quantities.

What the future may hold is perhaps linked up with certain tendencies in the trade. In bread production, wrapping of bread has come to stay, and this entails the most rapid cooling possible after leaving the oven. If the present development of the larger companies capable of greater capital expenditure continues it is reasonable to anticipate the installation, either of systems of enclosed shelves through which cold air can be circulated, or, more efficient, a conveyor system in which the loaves are carried through the cooling system and emerge ready for packing. As this last is already accomplished by machinery the whole plant may well be combined.

Beef Shipments from Australia

It is anticipated that shipments of beef and veal from the Commonwealth to the United Kingdom in 1937 will be the largest since the trade began last century. Indications are that exports will be very much heavier than usual for the second half of this year. The estimate of supplies which will be available for export for arrival during this period is 1,579,845 cwt. If this estimate is realised and the whole quantity is shipped, the total for the year will exceed 2,360,000 cwt. The increase on the 1936 total would be about 30 per cent. In its annual report the Australian Meat Board states that a limited expansion of Australian beef and veal exports to the United Kingdom is provided for by the further restrictions placed on foreign supplies under the Anglo-Argentine agreement, and by the undertaking of the British Government that the quantities so made available will be allocated to Empire suppliers. Total imports for the year 1936 were 11,764,000 cwt., and this figure may be taken as a minimum till the end of 1939. With the progressive restriction on foreign supplies, this would allow for a total of Empire imports in 1938 of 3,369,000 cwt., and in 1939 of 3,454,000 cwt., representing increases of 230,000 cwt. and 315,000 cwt., respectively, on the totals for 1937. Australia's share of these totals would depend on the ratio as between Australia and New Zealand, and also on the proportion allocated to smaller Empire suppliers. These are the minimum figures, and, if the state of the market permits, considerably greater quantities are likely to be admitted.—*The Chamber of Commerce Jnl., January*, 1938.

Freezing and Cold Storage of Herring
(concluded from p. 90)

After freezing, the herring must be well glazed. Care should be exercised in handling the frozen fish, since the tails are extremely brittle. Any damage done will cause difficulty in the subsequent machine-splitting of the thawed fish. After glazing, the herring should be carefully packed in boxes and transferred to the cold store. It is essential that glazing, packing and storing be carried out rapidly in order to avoid any undue rise in temperature. For storage up to two months, a temperature of −20° C. can be used; for longer periods, temperatures of −28° to −30° C. are necessary. At these latter temperatures well-glazed herring will remain in excellent condition for at least five months.

Thawing Effects

On removal from the store the herring are best thawed in running water, and in order to prevent water-logging, individual fish should be removed as soon as thawed. The thawed fish will look somewhat duller than fresh fish. In all other practical respects they are equal to fresh; in fact, it is extremely difficult to distinguish between kippers made from herring that have been stored under ideal conditions for six months and those made from fresh fish.

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Refrigeration in FRANCE *for* FRUIT AND VEGETABLES

THE AVIGNON refrigerated station of the Société Française de Transports et Enterpôts Frigorifiques, which was put into service in the middle of 1936, serves principally to facilitate and make as successful as possible the disposal of produce such as fruit, vegetables, etc., from the surrounding district, so that it may be marketed to the best advantage in more densely populated places. This railway station with its cold store should in time become an important centre for the distribution of fruit and vegetables to the most important markets in France and other countries.

The new railway station for refrigerated produce is directly connected by a branch line 1,250 m. long to the shunting station at Avignon-Fontcouverte, and comprises the following buildings:

1. The main building consisting of ground floor and two upper floors. On the ground floor and first floor are 10 cold rooms, and on the second floor an ice factory with a capacity of 90 tons in 24 hours.

2. A hall which serves for checking, assorting and weighing the goods on arrival and departure.

3. A building at the north end of the main building, on the ground floor of which are arranged the brine cooler and brine pumps, a tank for the warm water from the condenser used for thawing the ice cans, the accumulator for the liquid ammonia, workshops and an office for the engineers in charge; on the first floor, the air coolers for pre-cooling the railway trucks and for air for ventilation of the cold rooms, the ammonia condensers and the oil separators; and in the neighbouring room the transformer plant.

4. The engine house adjoining the fore-mentioned building.

5. The administrative buildings, comprising offices for the manager and the clerical staff.

The buildings are surrounded by platforms varying in breadth between 1·5 and 3·5 m., from which the trucks are loaded and unloaded, and which also afford means of communication between the buildings.

6. The covered hall for the trucks, in which six large railway goods wagons can be pre-cooled simultaneously. At the roof level of the wagons, at each side of the hall and also along the west end, there is a gallery from which ice can be passed into the wagons through openings provided in the roofs.

The structure of the principal building and those adjoining it is entirely of steel, and 225 tons of sections and wide-flanged beams were used in the work. The buildings containing the offices, garage and living apartments, and the pumping station are of reinforced concrete.

The buildings are insulated in such a way that it is not possible for any cold to be transmitted through the steel work. Pure expanded cork has been used as the principal insulating material, and its insulating effect has been further improved by covering it with porous concrete on the outer walls and floors. More than 400 c.m. of cork were used; in the cold rooms, which are kept at a temperature of 14° F., the insulation is 20 cm. thick.

The refrigerating plant was installed by the Compagnie de Construction Mécanique Procédés Sulzer, Paris, the compressors being built in their works at St. Denis.

Two refrigerating systems are provided for the rooms in the ground floor. Some rooms are cooled by ventilation, the air being led through coolers situated outside the rooms and then led into the rooms through distributing ducts. Each cold room has its own air cooler installed in a neighbouring cell made of reinforced concrete. The coolers can be thawed off quickly, simply and economically by allowing the hot water from the condenser to trickle over them after the cold coils have been emptied. The remaining rooms are cooled by direct evaporation of ammonia in cooling coils arranged on the ceiling.

The ice store on the first floor is cooled by coils fitted on the ceiling. In the other five rooms the cooling coils are arranged between the ventilating ducts in such a way that they can also be used for air cooling when required.

The refrigerating plant (Fig. 1) comprises four vertical compound ammonia compressors, each with two double-acting cylinders arranged in tandem, working without inter-cooling.

In the adjoining building are three ammonia condensers. Three electrically driven cooling pumps, each of 50 c.m. per hour capacity, draw cooling-water for the condensers from a 12 m. deep well beside the pump house. In the same building are the two brine coolers. In the same room various other apparatus is installed, such as the oil separator, accumulating bottle for liquid ammonia, de-aerator and the air cooler for pre-cooling the railway trucks.

The air renewal plant has to ensure regular and effective renewal of the air in the cold rooms—a point of particular importance when storing eggs—without any risk of spoiling the foodstuffs stored there. The only air admitted is fresh filtered air at the same temperature and with the same degree of humidity as the air in the cold rooms. The plant consists of an air filter, a centrifugal fan capable of delivering 2,000 c.m. of air per hour, an air cooler with brine circulation and capable of cooling this air, an electric air heater for warming by 20° F., a distributing network consisting of insulated air ducts with regulated valve for each separate room. In addition there is a portable ozone apparatus for freeing the air from smells and for sterilising the air in the store rooms.

The ice making plant (Fig. 2) is installed on the second floor of the main building.

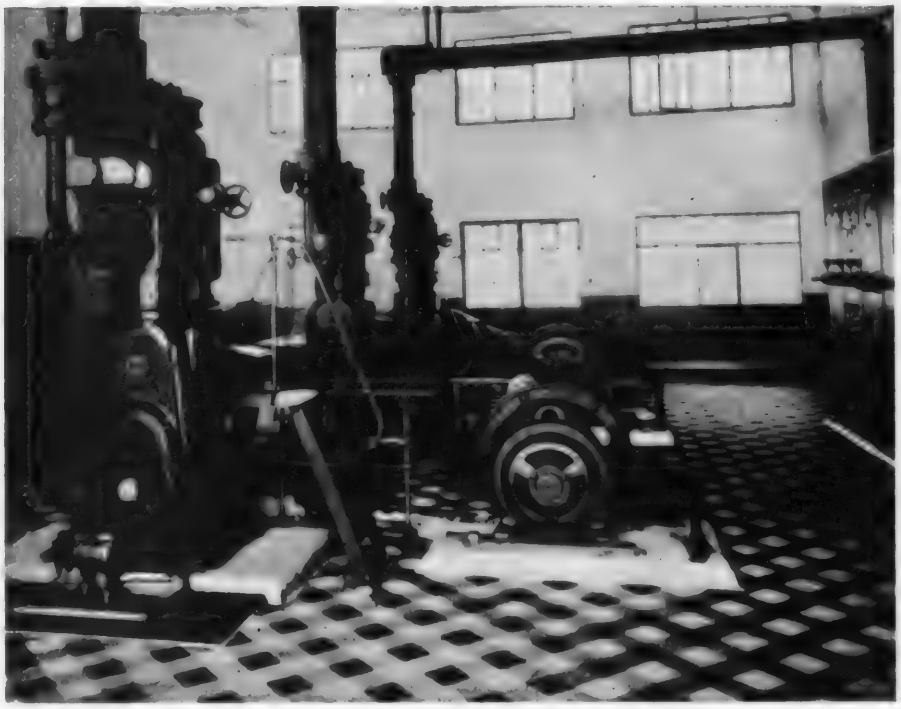


FIG. 1.—Compressor room in the refrigerated railway station at Avignon, equipped with three Sulzer ammonia compressors, each with a rated capacity of 1,000,000 B.Th.U. per hour, supplied by the Compagnie de Construction Mécanique Procédés Sulzer, Paris.

The water used for ice making is taken from a separate 14 m. deep well, by two air lift pumps; the water from this well is faultless as regards clarity and purity, this being confirmed by repeated analyses. Nevertheless, for absolute safety the water is also sterilised and finally filtered through active carbon.

The question of ice handling was also given special attention, in order that the work of loading the railway trucks and lorries should be reduced to a minimum. Two trucks and a well-designed system of ice slides leading to the loading platforms and to the railway trucks allow the ice blocks to be sent direct from the ice table to the place where it is required.

On the ground floor are four cold rooms with a common ante-room. Two of them serve for keeping butter and similar foodstuffs at a temperature of 14° F., one for keeping eggs at 22° F. and the fourth for storing fruit, vegetables, etc., at temperatures of 32° to 35° F.

On the first floor, one room is used as an ice store; it is kept at a temperature of 23° F. and can hold about 200 tons of ice. The other five rooms, which open into a single corridor and are kept at temperatures of 32° to 35° F., serve for storing fruit, vegetables, etc.

The heat and moisture given off from ripe fruit and certain vegetables, such as green beans, fresh peas, etc., increase with increase in temperature. Consequently, the heat developed and the quantity of moisture given off may be very considerable and cause great damage if such goods are packed together in a warm state in a confined space, as is often the case during transport. For this reason the normal means of ventilation have been found inadequate for the transport of fruit over long distances.

To help in preserving the goods during transport it was arranged that they should be cooled before dispatch, by keeping them for a sufficient time in spacious cold rooms, where cold air can circulate freely between the separate baskets and cases. This process, however, entails extra expense for handling and also a greater time for transport from producer to consumer. To eliminate these difficulties, arrangements have been provided to cool the goods after loading in the trucks by means of the cold current of air led through the trucks. This method gives good results but requires a very powerful plant.

The Avignon station for refrigerated produce is equipped with a plant capable of treating six railway trucks simultaneously. It comprises a centrifugal fan capable of delivering 32,000 c.m. of air per hour, a large air cooler with circulated brine with a rated capacity of 300,000 to 320,000 B.Th.U./h and two large well-insulated main air ducts, one of which serves as return. The air cooler consists of three similar elements composed of ribbed tubes, and the elements can be worked separately or together according to the number of trucks being treated. The air ducts are suspended under the roof of the hall; the branch tubes leading from them are made of special linen, are lined with felt and are connected to special air boxes which fit the holes in the roofs of the trucks through which the ice is loaded.

Since the trucks must not be cooled off beyond a certain minimum temperature, a remote thermometer is provided to warn the attendant as soon as the temperature limit has been reached.

The trucks are cooled in the following manner. They are loaded either in the refrigerated station itself or in a neighbouring station, and in the latter case are previously cooled with ice in order to prevent the contents becoming warm while being moved to the refrigerated station; the trucks are then brought to the hall below the cold air piping (Fig. 3). After the air boxes at the end of the tubes have been fixed to the openings on the

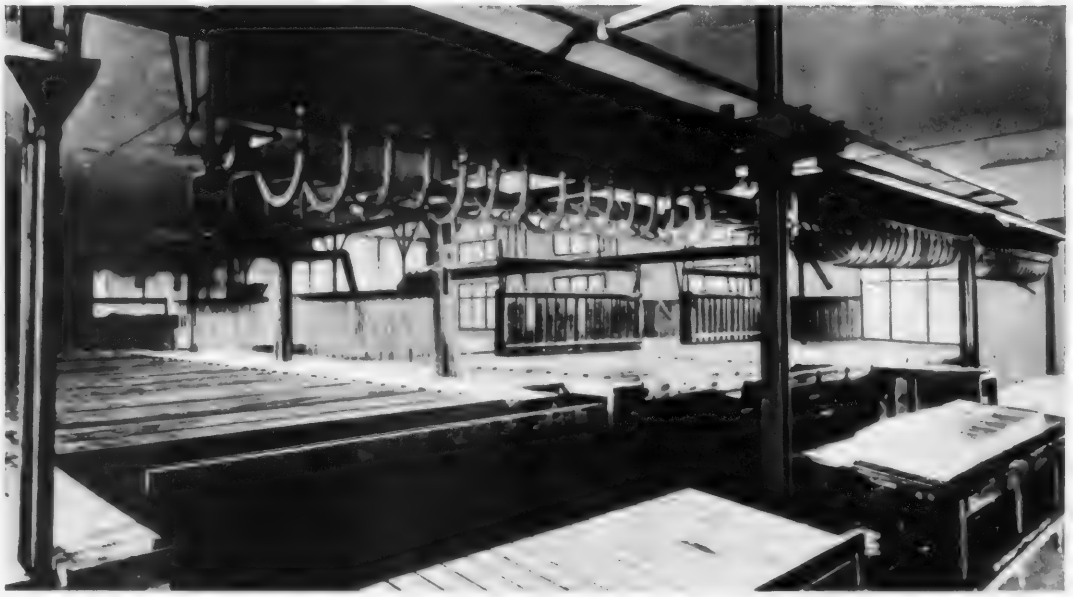


FIG. 2.—Ice tank for producing 50 to 90 tons in 24 hours, in the refrigerated railway station at Avignon; equipped with a refrigerating installation constructed by the Compagnie de Construction Mécanique Procédés, Sulzer, Paris.

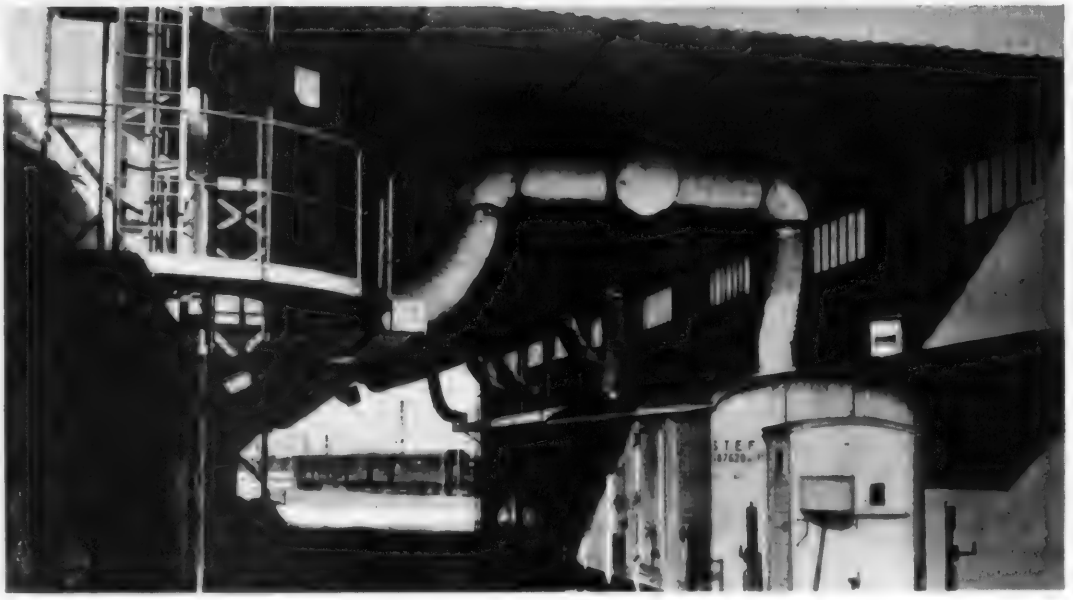


FIG. 3.—Precooling trucks in the refrigerated railway station at Avignon.

The three pictures in this article are by courtesy of Sulzer Bros. (London), Ltd.

roof of the trucks, the fan is started. The elements of the air cooler are adjusted to suit the number of trucks to be cooled, the temperature desired, the type of goods to be cooled and the momentary atmospheric conditions.

The warm air withdrawn from the trucks flows through the air cooler, where it gives up heat and moisture, and then passes again, cooled and dried, through the truck, where it is warmed and resaturated with moisture. The amount of cooling required for each circulation of the air depends upon the temperature desired and also, as regards humidity, upon the sort of goods in the truck.

Both factors can be controlled by suitable adjustment of the air cooler, which is effected by changing the number of elements in operation, the quantity of brine flowing through, or the temperature of the brine. The plant is consequently very flexible in its operation. In addition, the direction of flow of the air is reversed approximately every hour, thus ensuring uniform cooling of the goods in the truck.

The plant is capable of cooling the following:

3 trucks	from 82°	to 54° F.	in 5	hours
3 ,,	,, 68°	to 54° F.	,, 2½	,,
6 ,,	,, 82°	to 54° F.	,, 11	,,
6 ,,	,, 68°	to 54° F.	,, 5½	,,

The goods may naturally be cooled to a lower temperature, but little advantage is gained, as the rate at which heat and moisture is generated is, at 54° F., retarded to such an extent that further cooling can, if required, be easily effected during transport in the refrigerated truck itself. Since the goods are usually intended for immediate sale, they must not be too cold on arrival, otherwise they will be covered with moisture when the truck is unloaded.

Book Reviews

A. L. Bacharach, M.A.(Cantab.), F.I.C., Reviews Vitamin Book

With legislation impending to consolidate and amend, and probably also to extend, existing food law, the food technologist will once more be overhauling his methods. As has been so often pointed out by public analysts, consultants and works chemists alike, to welcome standards and definitions is merely a rhetorical gesture unless standards can be measured and definitions verified.

The eyes of foods chemists during the last few years have been turned with some anxiety to those biochemical colleagues whose business—by no means an easy one—it has been to work out methods for quantitative estimation, however approximate, of certain food constituents hitherto escaping chemical analysis. It is perhaps unfortunate that historical accident has grouped together under the general term "vitamins" a number of substances so diverse as a hemicarotenoid alcohol, a partially transformed steroid, a condensed pyrimidine-thiazole compound, a simple sugar product and an *iso*-alloxazine riboside! It is obvious that no single chemical procedure can suffice for methods of estimating so motley a mob; it is perhaps the more surprising that their biological estimation should be based upon certain common principles.

It is these principles that Dr. Coward describes and discusses in her admirable monograph. Her procedure is an intensely practical one, theoretical points being considered when they arise, rather than for their own sake. Such an approach derives logically from the fact that Dr. Coward has learnt vitamin assay in a very practical school.

Many will need this book because they are themselves practitioners who may benefit from Dr. Coward's own experience, so clearly described in her book; there will be still more who need it because their work demands that they shall understand just what degree of precision applies not only to biological assays generally, but also to individual vitamin determinations. This is made clear by Dr. Coward even to those who, like the reviewer, have an anti-mathematical diathesis! The elementary concepts at the base of statistical methods, particularly that of the all-pervading normal frequency distribution curve, are here marshalled together in such a way as to afford few difficulties of comprehension even to the post-matriculation student. And it is unfortunately true that desuetude (or original sin) has reduced to or kept at that mathematical level most of us who are engaged in the practice of industrial or analytical chemistry. We must all benefit from a careful reading of Dr. Coward's excellent monograph.

Biological Standardisation of the Vitamins. By Katherine H. Coward, D.Sc. Pp. 227. Baillière, Tindall and Cox. London. 1938. *12s. 6d. net.*

A Modern Mrs. Beeton

There are so few things given free in this world that it seems a shame to criticise adversely any aspect of a gift to the public.

Perhaps from this standpoint it would be very wrong to be the slightest bit rude to Miss Janet Bond's book.* This reviewer will therefore proceed to throw the very minimum of brickbats and then hand over the bouquets which Miss Bond undoubtedly deserves for her little book.

First, this review is somewhat belated, as it lay on the desk for a week or so—unidentified as the modern Mrs. Beeton—casual visual association connecting it with a "Penguin" book. A more durable cover might have been preferable, especially when one considers that its abiding place will mainly be the kitchen. It would be in no danger from grease, little pools of water, etc., in the Bureau's ideal kitchen, but one dreads to think of its state after a few weeks' use in less elegantly appointed ones!

Interpolating a tiny bouquet, the "Introduction" should whet the appetite of the intelligent housewife. It is, however, doubtful whether the "Story of Canned Foods" will appeal, and it might have been written in a slightly more picturesque way; but as there are only six pages of it, it may easily be skipped. The list of canned food varieties is excellent and will come as a surprise to many housewives. This list is rendered doubly useful because it is possible to write or telephone Miss Bond asking where the products mentioned can be obtained. The household hints are useful.

In the little section "Unexpected Guests", there is included a recipe which might have appeared better under its appropriate heading. The recipes on the whole are well selected and clear.

The adoption of a canner's description of sizes among the recipes is not particularly illuminating to the housewife, and it is questionable whether most shop assistants would be of help. It is true that these sizes are "translated" in the glossary, but sizes in pounds would appear better in the text.

Miss Bond has made a valiant attempt to reduce the subject of dietetics to 8½ pages, and the result may be read with advantage by the housewife.

Altogether an admirable little book—sufficiently admirable to justify the small criticisms contained above.

W. G.

* *Janet Bond's Book: A Practical Guide to the Use of Canned Foods. The Canned Foods Advisory Bureau, Ltd. Pp. 128. Published free.*

Pectin Substances

Braconnot first described pectin substances over a century ago, and since that time the literature of the subject has been steadily growing. Particularly following the earlier papers of von Fellenberg, 1917, and since the war, has the literature expanded, as pectin presents many points of interest to academic and technical chemists alike. Much of the information available is scattered through a number of scientific journals and bulletins of research stations, not always easy of access, and the present volume, which gives a complete survey of pectin from historical, constitutional, and technical viewpoints, should be welcomed by those chemists and others interested in the subject. The necessarily brief accounts to be found in textbooks suffer almost invariably from inaccuracies and lack of up-to-date information, and so far as the writer is aware the best available review (in English) is that published by W. H. Branfoot (M. H. Carre) in 1929, while more recently (1937), A. G. Norman has included a valuable chapter on the subject in his book on Cellulose, Polyuronides, etc.

In this, the second completely revised edition, Dr. Ripa has made the historical approach to the subject, and the first part of the book, some 110 pages, is devoted to an account of the early researches on pectin and of those which have been pursued since 1900. This survey is remarkably complete, and, indeed, the whole book is marked by a thoroughness and attention to detail which enhances its value as a book of reference. A re-perusal of the earlier work, particularly that of Frémy, again impresses one with the fact that, though our knowledge of pectin is much extended in matters of detail, the findings of the earlier workers are still fundamentally correct. We still lack certain knowledge of the chemical constitution of pectin and its congeners, in spite of the intensive work which has been performed in English, American, and Continental laboratories. The most important contributions have been made by Ehrlich during the last twenty years, and he rightly occupies an important place in the book under review. Nevertheless, it is extremely un-

(*Continued on page* 104.)

ENTERING THE ENGLISH MARKET

German Food Machinery Makers Appoint British Selling Agents

A VERY wide range of filling equipment has recently been introduced to the English market by the Pascall Engineering Co., who are already well known for their British-made grinding, blending, sifting and mixing equipment, and who have been appointed sole selling agents in this country for Wilh. Busse and J. Perl of Berlin.

There are two types of powder-filling machines—one which measures off a definite quantity of powder and discharges it into containers, and the other, which does the double work of filling and compressing. The purely filling type of machine is suitable for handling powders of high density where no subsequent tamping or pressing is necessary in order to compress the bulk into a given-sized container.

The second type is particularly valuable for handling powders of light textures which require pressure in order to introduce considerable bulk into a small compass. In some cases it is possible to reduce the original volume of a powder by half.

One notable point is that it is possible to fill completely a container of which the orifice is smaller than its diameter, and a special arrangement extrudes all the air. The output capacity of these machines ranges from 1,200 up to 2,500 fillings per hour, and the power requirements are quite moderate. Other machines include a range of automatic filling and measuring machines for handling pastes, creams, liquids, medicines, etc., and are suitable for filling bottles, jars, pots, collapsible tubes, etc.

A very high degree of dosing accuracy is claimed for these machines, that of the hand-operated type being of the order of + or −0·5 per cent. and the power-driven types 0·05 per cent. Thus they should have a wide application for handling products which have perforce to enter a highly competitive market where wastage must be strictly avoided.

In addition to the simpler filling machines described above, and which are available in either hand- or power-driven versions, there are also automatic and semi-automatic collapsible tube filling, measuring and closing machines, which not only fill the tubes with a measured quantity of material, but also close them, and imprint code numbers, dates, etc., on the tube folds.

The output capacity of all these machines, in terms of fillings per hour, is high, ranging from 1,200 per hour for the simple hand-operated machine up to 2,000 per hour for the fully automatic power-driven filling and closing machines, and as both their high degree of accuracy and their output make no demands on the skill of the operator they should have a wide appeal.

Incidentally, the range also includes some hand-operated collapsible tube closing machines, of which the simplest version will close 800 tubes per hour with either two or three folds, while a more elaborate model will close 1,500 tubes per hour, with either two or three folds, with but one rotation of the operating crank.

So far as bottle-filling requirements are concerned, it may be said at once that every need can be met from the complete range of machines available, from a single filling valve handling a matter of 300 bottles per hour, up to a multiple head machine capable of filling as many as 4,000 per hour.

The single valve, known as the "Unifiller", is made of brass, nickel-plated, the filling tube being of pure nickel, and it is usually connected by a rubber tube to a gravity tank. It is automatic in operation, in that it opens as it is applied to the bottle and closes immediately on removal. There is therefore no wastage of material and it calls for no particular skill in operation. The next step is the "Twinfiller", which, as its name implies, is a twin-head machine. This is a development of the "Unifiller" and consists of an elevated pressure tank of 4 gallons capacity mounted on a rigid column and fitted with twin filling valves, thus forming a self-contained unit. The apparatus is adjustable so as to accommodate different sizes of bottles, and it can be arranged for filling both sprinkler-neck and cork stopper bottles. The twin filling valves operate independently of each other and are not only automatic in operation but are provided with filling adjustment, so that over filling of the bottles is impossible and there can be no wastage. The bottles are presented to the filling valves mechanically, thus leaving the operator's hands free and ensuring a high rate of output.

The 4-gallon pressure tank and twin filling valves form a self-contained unit which is the "Twinfiller" bottle filling apparatus described here.

In order to cater for greater outputs there are four- and six-headed machines, which can be supplied either with self-contained pressure tanks or can be arranged to be fed from main storage tanks, the latter feeding the liquid to the machines either by gravity or under pressure, or, if desired, vacuum filling can be arranged. The filling valves of these machines are similar to those fitted to the "Twinfiller" and possess the same features of filling height adjustment, automatic operation and adaptability to different sizes of bottles. Outputs range from 800 to 1,500 bottles per hour, according to size of bottles, pressure or vacuum applied to the liquid, and its viscosity.

Finally, there is a very fine example of a multiple-headed bottle filler, a ten-valve fully automatic machine with an output of 4,000 bottles per hour, which can be adapted for filling either sprinkler-neck or cork stopper bottles. An interesting feature, and one which assists considerably in ensuring a consistently high rate of output, even with unskilled operators, is that when the machine is arranged for filling sprinkler-neck bottles, each valve is equipped with a self-centring device so that the filling tube is automatically fed into the small aperture of the bottle.

There are other machines in the range, such as the twin-filling and measuring machines for filling battery cells, essence bottles, and similar small containers where very low production costs are essential for a low-priced, highly competitive market, and in addition some very useful bottle-washing and emptying apparatus.

We understand that the Pascall Engineering Co., Ltd., cordially invite all those who are interested to send for a fully illustrated catalogue, or to call and inspect the machines at their London Test Station, 20, Dean Street, Oxford Street, London, W. 1.

Sir Walter Langdon Brown discusses—

FOOD . . . . FUSSINESS . . . . and other things

I WOULD like to protest strongly against the crank diets which suddenly come into fashion and almost as speedily fade away: here to-day and gone to-morrow—but a harmful influence while they last, said Sir Walter Langdon Brown, M.A., M.D., D.Sc., F.R.C.P.

Neurosis and Fussiness about Food

"Neurosis is generally characterised by regression to more primitive modes of thought, and for the infantile mind the working of its alimentary canal is the prime interest, in which, indeed, the infant's mother and nurse share.

An anxiety state, therefore, generally involves a certain fussiness about food.

This was impressed upon me forcibly some time ago when a patient, whose condition had nothing to do with diet, asked me what she should eat. I gave simple instructions for a wholesome diet. 'Aren't you going to knock me off anything?' she asked. By this time I had realised the type I had to deal with, so I said, 'No.' 'Oh,' she replied, 'not even tomatoes?' Here was a patient who actually craved for prohibitions with which to feed her neurosis—prohibitions which I firmly refused to supply."

When Japan Began to eat More Flesh Food

Sir Walter Langdon Brown then explained that the human body had to turn the flesh of beasts, fish, and fowl into human flesh, and it did this by breaking their protein up into its constituents, and from these constituents the human liver selected those it needed and reassembled them into typical human flesh.

"As Dr. Robert Hutchinson says, protein is a food of which we must have *too much* in order to have enough. A diet containing the minimum of protein to repair the waste of the tissues may not be suitable in *quality*. It may not contain the right constituents for building human tissue, and health accordingly would suffer.

The first effect of an improved purse is an increase in the amount of protein consumed. This is true of individuals and of nations. The rise of Japan was accompanied by a great increase in the consumption of protein. Anyone who wishes to draw moral conclusions from that statement is at liberty to do so."

Why Vegetarians have to eat a Lot

Sir Walter explained that protein foods were usually expensive, and the lower, cheaper kinds tended to lack constituents necessary for easy conversion into human flesh. "This applies to most vegetable proteins," he said. "That life can be sustained on them most vegetarians can testify, but a considerable bulk of food has to be taken in order to consume the right amount of protein, and the greater chemical difference proves a drawback.

Good Discipline but Bad Physiology

The drawback to fat, apart from expense, is that it is difficult to digest. Children generally loathe it and like sugar, which can be converted into fat. Thirty years ago I said that to force fat on a child that dislikes it may be good discipline but bad physiology. Since then we have learned more reasons why some children tolerate fat badly.

Brain Never Loses Weight

If the total intake of food falls too low the body feeds on itself. First it uses up its reserve of fat. Then it lives on the spleen and liver, and next on the muscles; but the master tissues, the brain and the spinal cord, refuse to pay their quota into the common pool, and even in death by starvation they have lost no weight. There is no communism about the brain."

The Perverted Ingenuity of the Inland Revenue

Sir Walter spoke of the serious consequences which would follow if the human body were deprived of common salt, and mentioned that salt had therefore offered special attractions to the tax-gatherer in certain countries.

"We can understand why the French peasants in the eighteenth century resented that salt tax, the Gabelle, and how Gandhi found a similar tax such a useful political handle. A salt tax is a tax on health, levied on those who can least well afford it, and deserves as much censure as the old, iniquitous window tax, another example of the perverted ingenuity of the Inland Revenue."

Importance of Sunlight and a Mixed Diet

Sir Walter discussed certain new aspects of the science of nutrition and said that they gave "scientific sanction to our belief in the necessity of sunlight and a mixed diet drawn from as many sources as possible, and should discourage fads, extremes, and one-sided views and practices in dietetic matters. The best sources of vitamins are the dairy and the garden. An ordinary mixed diet contains a sufficient supply of all the vitamins to maintain health. But when diet is inadequate it is a different story."

Bad Distribution Cause of Malnutrition

Sir Walter said that he would like to enter a *caveat* against panic: we were not becoming worse in dietetic matters, but more conscious of defects which had always been present and in the past to an even greater degree. But we had recently acquired knowledge which enabled us to recognise and remedy defects.

"Inadequate distribution is at the root of many of those troubles. Let me quote the following examples: During the year ended May 31, 1936, 1,200 tons of herrings and 50 tons of other fish were officially stated to have been destroyed at Scottish ports; and as a result of a 'glut' of apples in 1936 a substantial proportion of the crop was left to rot—yet a large fraction of the community at the same time was below the optimum intake of both the protein which might have been supplied by the herrings and the vitamin C which might have been supplied by the apples.

I do not see otherwise how to account for the fact that the vital statistics of Denmark and Holland are better than ours, while their annual consumption of 'protective foodstuffs' such as dairy produce, meat, eggs, citrus fruits, and bananas per head of the population are, generally speaking, less than our own. It must be a question of faulty distribution, in the face of which fact the wholesale destruction of valuable foods in order to maintain their price can be described only as anti-social and criminal." (*From a lecture delivered at the Royal Institute of Public Health and Hygiene.*)

Frosted Foods from South Wales

ARRANGEMENTS have been made with the Treforest Trading Estate, South Wales, for a site on which to erect a plant for the commercial production of foods frozen by the Haslacher process which, it is claimed, will keep any kind of vegetable or fruit in perfect condition for long periods running into years.

The plant as at present planned will be only a small one with an output of 24 tons per day, but the intention is to duplicate the units as required. Manufacturing is planned to begin next June.

The Treforest Trading Estate has been chosen because there is already a plant under construction there for the production of dry-ice (Carbo-Ice Industries, Ltd.), which would be used in the transportation of the frozen foods.

The process is in commercial operation in the U.S.A. by a British-controlled company, and a British company, Garden Fresh Fruits, Ltd., is to operate it at Treforest. The managing director is Major Geoffrey Moule and the technical director is Mr. Walter S. Josephson, managing director of Carbo-Ice Industries, Ltd., whose factory at Treforest is in an advanced stage of construction. Another director is Captain H. W. Forester.

Mr. Josephson, who is founder and former President of the Dry-Ice Corporation of America, told the Press that the process differed from others because instead of freezing the individual vegetable a thin film of water-ice is formed between each one and the result was a great cake of ice which was 90 per cent. produce and 10 per cent. ice.

"The process", he said, "has been tested by the U.S. Department of Agriculture, who certified that the vitamin content remained unimpaired after long periods of preservation. No preservatives or chemicals are used.

The factory at Treforest will give direct employment to approximately 150 people and will also result in help for the small farmers within a radius of 100 miles, for they will be assured of a firm market for their crops when produced.

As far as emergency supplies for war-time are concerned, every existing water-ice plant and cold-storage warehouse in the United Kingdom is capable of being converted with small outlay of time and money into a producing unit of frosted foods.

The operation of the factory at Treforest could thus be amplified and multiplied throughout the United Kingdom, and the foods so prepared could be stored in warehouses located at strategic points or in underground storage, such as mines, caves or any other refrigerated space, and these foodstuffs can remain in such storage with absolute protection for long periods of time."

International Federation for Documentation

THE International Federation for Documentation will hold its fourteenth International Conference on Documentation under the Presidency of Sir William Bragg, O.M., President of the Royal Society, at Lady Margaret Hall, commencing on Wednesday morning, September 21, until Sunday, September 25. Thereafter, members of the Conference will visit the Science Museum, London, on Monday, September 26.

Advantage will be taken of the meeting being in England to hold Joint Sessions on the mornings of Saturday and Sunday with the Association of Special Libraries and Information Bureaux. All those who appreciate the vital importance of the organisation of knowledge will realise that the visit of this International Conference to England is an occasion of exceptional moment.

Papers will be read by leading authorities from all countries upon aspects of the following, and other, subjects: Theories of Classification, Cataloguing and Indexing—Methods and Apparatus used in the Organisation of Libraries, Archive Repositories, Registering and Filing Centres—Photographic and other Copying Processes in their Application to Bibliographical Problems—The Making of Abstracts from Periodical Literature; possibilities of co-operation—Directories of Information—Exchanges between Publishing Bodies, National and International—The Loan of Books and Documents; principles and possibilities—The Practical Application and Use of Bibliographies. In particular an effort will be made to obtain adequate representation of the varying points of view of workers in diverse fields. At a recent International Congress the view was expressed that it was desirable to widen the bases of International Bibliography and Documentation. At the forthcoming Conference a special attempt will be made to secure authoritative reports upon the present state of bibliographical work in such fields of learning as Archæology, Archive work, Economics, History and Linguistic Studies, in addition to the Natural Sciences and their Applications.

Offers of papers are invited and should reach the Secretary, Miss M. Gosset, The Science Library, South Kensington, London, S.W.7, not later than March 14. If possible, abstracts should be included, and should be forwarded through the respective National Sections of the International Federation for Documentation.

The programme will include visits to some of the many interesting places in the neighbourhood, together with other social functions. The total cost, exclusive of reports and visits, will not exceed £1 a day.

GENERALITIES

West Sussex Sugar Factory?

The Beet Committee of the West Sussex Branch of the National Farmers' Union states that a company has acquired a site at Chichester for the erection of a sugar-beet factory, but are prevented from doing so owing to their not having a licence. This situation has caused no little agitation for the granting of such a licence, and it is understood that the Sugar Commission is to be asked to do something about it.

* * *

No more Butter and Cheese

Southern Rhodesia has as from January 1 last prohibited the importation of butter and cheese into the Colony from all countries except Northern Rhodesia, Bechuanaland Protectorate, and Swaziland, except under licence granted by the Minister of Agriculture and Lands. This decree is contained in Proclamation No. 31 of 1937.

* * *

Levers Gain Control

Newfoundland's only margarine manufacturers, Harvey Brehm and the Newfoundland Butter Company, will now be controlled by Lever Bros., and Unilever.

* * *

Pineapple Can Size Altered

Notification No. 1,319 from H.M. Trade Commissioner at Singapore provides, *inter alia*, that the minimum size of a can as laid down under the Pineapple Packing Regulations shall be altered from "$\frac{3}{4}$ lb. Tall" to "$\frac{3}{4}$ lb. Squat".

* * *

N.S.W. Food Act Revised

The New South Wales Pure Food Act and the Regulations thereunder, revised to October, 1937, has been consolidated. A copy of this consolidation can be seen at the Department of Overseas Trade, 35, Old Queen Street, London, S.W. 1. Reference 16366/38 must be quoted by those interested.

* * *

Thanks

Mr. H. A. Jackson of A. Boake, Roberts and Co., Ltd., wishes to thank all friends for their expression of sympathy to his family and himself on the tragic death of his youngest son.

Canned Caviar

Sturgeon's roe, that expensive delicacy which we know as caviar, demands careful packing. There are interesting features in the "Metal Box" containers now manufactured for J. and T. H. Staples, Ltd., of London. The caviar is packed to above the body's rim and the very deep close-fitting lid pressed tightly down on to its surface.

Air, enemy to caviar, is forced out. A thin knife blade slid between lid and body helps it to escape. Both lid and body are lacquered inside. The body's side seam is soldered outside.

An interesting feature is the "anchor"—the mark on lid and body which is a guide for the lid to be put back in exactly the same position after removing for inspection or other purposes. The reason for the anchor is this: The pressed-down surface of the caviar may be broken. A portion will then adhere to the lid. The lid must be put back in exactly the same place so that this can go into the broken surface whence it came. Otherwise it spoils an unbroken part and the hollow it has left is a trap for air.

* * *

Ice-Cream

For the progressive manufacturers who are looking forward to the summer harvest from the ever popular sale of ice-cream, a catalogue of equipment for the manufacture and sale of this commodity, which we have received from the manufacturers, James H. Randall and Son, Ltd., should prove interesting. Address to which requests should be forwarded is: Green Street Works, Paddington, London, W. 2.

* * *

American Poultry Freezing

Leaflet from Z Pack Corporation, of New York, describes plant for quick-freezing poultry. Claims: No cooler shrink, no freezer burn, no freezer shrink, full flavour, natural colour, natural skin texture, bright odourless viscera, no bile-stained livers.

New Rowntree Line

Dux Bar selling at 2d. is a milk chocolate containing almonds roasted by a new process, and is the result of intensive experimentation on the part of the manufacturers. The chocolate is specially prepared to provide just the right blending with the almonds. The three dozen decorated outer makes an artistic pack with a prominent pictorial display flap in chocolate on a cream ground, illustrating the chocolate bar and the nuts.

* * *

Impression of Progress

An excellent booklet from Elliot Bros. (London), Ltd., electrical and mechanical engineers, reviews the progress and development of the concern since it began in 1800. It is plentifully illustrated and is altogether a worthy production.

Cereal Chemistry

Our article on this subject by T. H. Fairbrother, which appeared in our January issue, has aroused considerable interest. Cambridge Instrument Co., Ltd., write to tell us that with regard to the mention of the measurement of moisture in the article, they have for some years been supplying an instrument which enables cereal moisture tests to be carried out very rapidly and without requiring technical knowledge in its operation.

* * *

Exhibit

We noticed that the old-established concern of W. J. Bush and Co., Ltd., had a distinguished exhibit at Olympia. It included an impressive array of all the essential oils that can be distilled in this country. Prominent too was the show of fruit essences, natural fruit extracts, and harmless food colours.

* * *

New Factory Sites

Over 450 acres of land near Elstree on the outskirts of London have been acquired by John Laing and Son, Ltd., with the object of developing a new industrial estate. Already factories producing photographic supplies are in existence nearby and there is ample room for the development of similar industries, particularly the chemical, because of the close proximity of the film industry.

In the scheme under review one notable feature is evident and that is the abolition of the old bugbear of a residential and industrial estate when they were built together which, because of the obvious dependence of the one on the other, seemed inevitable. This was the passage of goods to and from the factories, centred in the middle of the housing estate, by heavy traffic along roads made primarily for residential traffic —a danger to children and others generally. On the new estate, however, none of the industrial traffic will traverse residential roads, but will immediately filter through to main from service roads and so permit the better distribution of traffic on to and over the trunk traffic roads.

* * *

Dairies and Dawsons

A well-illustrated catalogue of modern dairy plant from Dawson Bros., Ltd., of Gomersal, near Leeds, gives interesting data on the subject. Dawson's "Straight Line" system for milk bottles is given due prominence in this altogether handsome production.

Health Congress

The Right Hon. the Earl of Bessborough has consented to act as President of the Health Congress of the Royal Sanitary Institute, which is to be held at Portsmouth from July 11 to 16, 1938.

The Congress will be divided into sections dealing with Preventive Medicine; Architecture, Town Planning and Engineering; Maternity, Child Welfare and School Hygiene; Veterinary Hygiene; National Health Insurance; Hygiene of Food; Tropical Hygiene.

In addition, there will be conferences of Representatives of Local Authorities, Medical Officers of Health, Engineers and Surveyors, Sanitary Inspectors and Health Visitors.

* * *

G.E.C. Organisation

On the inside front cover of a new 66-page book which surveys the organisation and resources and gives examples of the recent installations of the General Electric Co., Ltd., the capital of the concern is given as £9,600,000. Certainly this example of trade literature is entirely worthy of an organisation with a capital of such dimensions.

Lavishly illustrated in photogravure its pictorial appeal is irresistible, and combined with well-written copy and a stylish layout the whole job is as attractive as it is interesting.

* * *

Service *de luxe*

A unique feature of the service which the Lancashire Dynamo and Crypto, Ltd., offer to potential buyers of their food machinery, is the inclusion of an experienced chef, baker, and pastrycook on their Advisory Bureau. His advice is available free. This is assuredly an example of the real effort to give service which is evident among manufacturers to-day and which is one of the important factors conducive to a better understanding between buyer and seller so necessary nowadays.

* * *

Move

The Birmingham office of the United Steel Companies, Ltd., was recently moved from the old Martin's Steelworks in Princip Street to a modern suite of offices in the centre of the city, readily accessible from both New Street and Snow Hill stations. New address is: Union Chambers, Temple Row, Birmingham. Telephone: Midland 6321.

Important Appointment

Mr. Harold E. J. Cory, M.Sc., F.I.C.

One hundred and fifty years old Egglescliffe Chemical Works have a new Managing Director in the person of Harold E. J. Cory, M.Sc.Tech., F.I.C.

This appointment dates from February 1, when Mr. Cory took up his duties. He has left Chance and Hunt, Ltd., at their head office in St. Helen's Place, where for the last fifteen years he was Technical Manager for Sales. He was in this position when the organisation was absorbed in the I.C.I. group. From the years 1910 to 1915 Mr. Cory was with the Chance and Hunt Works at Oldbury. In the interim he held several important appointments all in the chemical field.

The old-established Egglescliffe Chemical Co., Ltd., at Egglescliffe, County Durham, is owned by the Hutton Wilson family. The late Managing Director, Mr. Cecil Hutton Wilson, who occupied the post almost since the war, is now retiring from active business and is, we understand, contemplating taking up his residence in Kenya.

Mr. Cory is a well-known figure in the London chemical markets. He has travelled extensively, and has a very intimate knowledge of the European situation. Over six feet in height, he was at one time a first-class footballer and swimmer. He is now something of a master on the "green cloth" and is one of the original members of the B.B.C. Choral Society.

CLEANLINESS IN THE FOOD FACTORY

In the interests of hygiene it is essential that the structure and interior of factories and buildings in which food is prepared and canned should be kept in sound and clean condition. The choice of paint plays no small part in the achievement of this ideal, and in the article below the application of a new type of pigment of particular value in the food industry is briefly discussed.

BY A SPECIAL CORRESPONDENT

A SUITABLE paint for interior application in a food factory should be both protective and decorative, non-toxic, and, above all, able to retain these qualities after repeated washing. Much research has been carried out in an effort to discover a paint possessing these properties in addition to good covering power and light value. Only during the past year or two has a product been evolved which fulfils these essentials. It is one pigmented solely by metallic aluminium in its newest manufactured form—a paste.

A paint of this description is non-poisonous, protects the surface to which it is applied by excluding corrosive materials or gases, and by reason of the smoothness of the dried film the settlement of dust particles is reduced to a minimum.

In order to appreciate these points it is necessary to consider the structure of aluminium paste pigment and its behaviour when, in the form of a paint, it is applied to any surface.

The pigment consists of flat particles of pure aluminium of a uniform size, which, owing to the method of manufacture, rise to the surface of the medium in which they are mixed and applied. In doing so, the metal particles form a highly reflective overlapping layer, a process which is technically known as "leafing". The opacity of this layer offers secure protection from the destructive action of light rays and, by reason also of its microlamellar structure, precludes the passage of moisture and similar corroding influences. The metal particles themselves are so small in area yet so irregular in shape that the surface of the paint film is extremely smooth, presenting no irregularities in which dust particles may lodge.

Light Saving

The surface of a paint film of this description reflects some 70 per cent. of the light incident upon it. It is, therefore, extremely valuable in the brightening of factory interiors. In one well-known works where beams, joists, ceilings and general structural work have been painted, lighting conditions have been so improved that an hour of daylight has been added to each working day.

Walls painted with this paint may be washed down at frequent intervals without impairing the brilliance of the finish, while the inclusion of mild alkali in the washing water is not in any way detrimental to the film.

Insulating Properties

Aluminium paint manufactured from paste pigment may be successfully used upon the roofs and walls of sheet-iron buildings in order to lower the internal temperature during summer months, and provide a more equable temperature during cold weather.

Radiation from exposed steam pipe line and conduit may also be effectively reduced at considerably less expense than would be the case were lagging employed. Tests have shown that two coats of aluminium paint insulate as effectively as a one-inch thickness of lagging, while the cost of material and labour for application is, of course, infinitely less.

Timber Preservative

In steam-laden and other highly humid atmospheres, distortion and deterioration of timber invariably occurs, and this may be obviated by the use of aluminium paint as a priming coat. The fine metal pigment particles effectively seal the capillary cells of the wood structure, and prevent both the ingress of moisture and the movement of the natural moisture content of the timber, which, as is well known, is one of the chief causes of "blistering" in paint films. A glance round any food canning factory will show innumerable instances in which aluminium paint will find ready application. Any type of surface—metal, timber, concrete, plaster, etc.—may be successfully painted, and repainting costs will be reduced to a minimum.

For Machinery and Containers

Aluminium paint made from paste pigment is ideal as a protective covering for machines, packing benches, conveyors, conduit, etc., and these are but a few of the applications which call for a paint film that is clean, bright and washable.

Another useful application of this type of aluminium is for metal container packs. By its use attractive articles of great sales appeal may be produced and, furthermore, corrosion of such containers due to the hygroscopic nature of the adhesive used for labelling is entirely obviated.

Aluminium pigment in a printing or stencil ink may also be used for marking bulk packing-cases.

Unique Covering Capacity

Aluminium paint made from paste pigment has phenomenal covering capacity per gallon. It is very economical, too, since only sufficient paste and medium need be mixed for the work in hand, all waste, therefore, being eliminated.

It is possible to treat with each gallon between 800 and 1,000 square feet, according to the nature of the surface upon which it is applied. Application is equally successful by brush or spray, and it is unnecessary to observe any special precautions, for, as stated previously, the pigment is essentially non-poisonous.

Aluminium pigment in paste form is made in England by the Northern Aluminium Company Limited, Bush House, London, and supplies of ready-mixed paint incorporating this pigment may be obtained from all leading paint manufacturers.

MEAT, METABOLISM AND FRUIT*

The Influence of Feeding Stuffs on Meat. By V. C. Fishwick, N.D.A.

In feeding experiments at Wye Agricultural College on pigs, inclusion of fish meal in the diet caused no taint in the meat, even when the proportion of fish meal was raised to 20 per cent., though with this proportion the pigs became unthrifty and their carcasses did not set. The intestinal contents and excreta, however, acquired a peculiar odour, and the use of water contaminated with these, for "scalding" or rinsing the carcasses, could cause the skin or internal fat to become tainted by absorption of volatile products. It is concluded that digested foodstuffs are not liable to cause taint, but the meat may become tainted by unsatisfactory treatment after slaughter.

Fat Absorption and Metabolism. By A. C. Frazer, M.B., B.S., M.R.C.S., L.R.C.P.

Dr. Frazer presented evidence that passage of fats through the walls of the small intestine can take place without hydrolysis to fatty acids and glycerol. In cats such hydrolysis cannot occur, for there is no lipase in the intestines. In human beings lipase is present, and part of the fats ingested penetrates the intestinal walls as fatty acids, but a large proportion penetrates unchanged. The fatty acid portion passes to the fat depots by way of the portal vein, liver and hepatic vein, but the unhydrolysed fat avoids the liver and passes to the fat depots by way of the lacteal lymphatics and the systemic vessels. The presence of particles of unhydrolysed fat in the blood was detected microscopically by use of dark ground illumination, and this means was used to study variations in the concentration of the fat particles in the blood in course of digestion.

The Concentration of Fruit Juices by Freezing. By P. L. Bilham, B.Sc., F.I.C.

Removal of water by freezing avoids the losses of volatile constituents and the impairment of flavour which result from evaporation, and it also involves much smaller energy changes due to latent heat. Its main disadvantage is the practical difficulty of separating the ice crystals from the juice. In the Krause process, which is operated in two Continental factories, this separation is effected centrifugally, and losses have been reduced to an economic figure. Concentration to about 40 per cent. of solids is effected in three stages, and if necessary the content of solids can be further raised sufficiently for storage by addition of sugar.

* Read before the Society of Public Analysts and other Analytical Chemists.

Pectin Substances (Book Reviews continued from page 97)

likely that some, at least, of the structures which he assigns to his products are correct. It is more likely that instead of the small closed rings which Ehrlich advocates, the structure of pectin will be found essentially to involve chains of galacturonic acid residues to which subsidiary groupings of the araban and galactan type may be bound chemically or physicochemically. The results of Link and his school in America, obtained by methods resembling the end group assay method which Haworth and Hirst developed in their studies on cellulose, starch, glycogen, etc., would tend to support this view.

The complexity of the problem of constitution, which is one largely for the attention of the organic chemist, is further indicated by a review of the methods of preparation and of the nature of the products obtained. While these show a generic similarity, it is quite obvious that much individual diversity exists, and that protopectin, pectin, pectic acid, etc., are terms which express not definite individuals but, in almost every case, heterogeneous mixtures. Considerations of this kind occupy a further 160 pages of the volume, and this section is undoubtedly of considerable value to the technical chemist as well as the research worker. A useful feature of this part of the book is the comprehensive list of patents taken out in the principal countries of the world, while the text is freely embellished with tables of experimental data taken from original papers dealing with all aspects of the chemistry and technology of pectin.

The last section of some 70 pages deals with jelly formation by pectin, the property on which its importance in the jam and confectionery industries so largely depends. As in previous sections, this aspect is discussed in considerable detail, methods of preparation and investigation and numerous types of jelly-strength testing apparatus being described. This field has been investigated to a considerable extent by American investigators, and their work is given due prominence. The book is free, in fact, from a defect sometimes to be noted in Continental authors, namely, a tendency to ignore or to treat inadequately the work of British and American investigators. An excellent bibliography concludes the work.

There are occasional inaccuracies and misprints, but these are not of vital importance. It is a little difficult to reconcile the formula given for cellobiose on page 18 with modern established views on its structure; however, correct formulation is given on page 101, which depicts a portion of the cellulose molecule. It is a little unfortunate that in several places the work of Nanji, Paton, and Link is referred to where Ling is intended, especially as it may involve confusion with the American school of which Link is the leader.

Apart from such minutiæ the book is very well set up in bold type and, as has been sufficiently indicated, is very full of information. In fact, with the aid of a few more diagrams and a wider spacing the 400 pages might well have been extended to 500.

F. W. N.

Die Pektinstoffe. By Dr. R. Ripa. Second edition. Pp. 404. Serger and Hempel, Brunswick. 1937.

Water and the Ministry of Health

THE British Association of Chemists have joined in the general agitation for Government control of water. Here is what is written in a letter sent to the Ministry of Health recently by the General Secretary of the Association.

"I am instructed by the Executive of this Association to express their grave concern at the conditions obtaining in the supplies of water for domestic purposes in this country, particularly at the fact that your Department has not the power to enforce the installation of purification and sterilising plant nor the daily testing of the water supplied for domestic purposes.

The recent enquiry at Croydon has revealed a most unsatisfactory state of affairs and has shown that there exists no legal standard of purity for water.

It appears from the statistics of your Department that there are over two thousand different suppliers of water, and that there is no official check as to the quality or suitability of the water supplied, nor is there any insistence that those who supply water for this important service should maintain efficient laboratories and staff for the proper testing of the supply.

This Association feels very strongly that such a grave defect in public administration and responsibility should be rectified with all possible speed and that, if necessary, suitable legislation should be introduced, empowering your Department to order that every water company in the country, large or small, should have the resident services of sufficient chemists to ensure the maintenance of a suitable standard of purity.

This Association is prepared to do whatever is possible by way of support and assistance to bring about an improvement in the present state of affairs and trusts that you will make full use of this letter."

PLANT AND MACHINERY

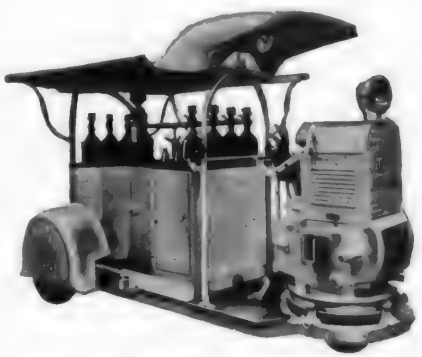
Steam Generation Efficiency

All types of coal (and coke) fired steam boilers can be operated at a good thermal efficiency provided that the right methods are adopted. The idea that the "Lancashire", "Cornish", "Economic", and other industrial designs are necessarily more inefficient than water tube boilers has no foundation in fact.

One of the main requirements for the best results with cylindrical and similar boilers is the elimination of the dependence upon natural chimney draught. Some type of forced or induced draught must be used, with the chimney acting mainly as a discharge for the gases. Thus the draught of a chimney depends primarily upon the height and the temperature at the base, and if modern scientific methods are adopted, including the use of fuel economisers, to reduce this temperature to the lowest point, the draught is lowered to such an extent that it is not possible to burn sufficient fuel to give normal evaporation.

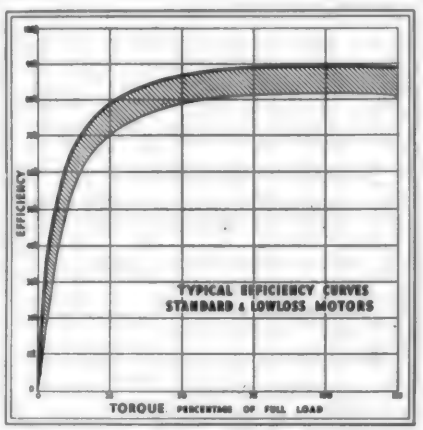
With forced or induced draught, however, maximum heat can be extracted from the gases under conditions of very high rates of combustion regardless of the chimney. The extra power used for providing the draught is only a minor matter compared with the saving obtained. For many conditions, and especially the use of smaller boiler plants, forced draught has advantages over induced draught, largely because of the "balanced" conditions in the combustion chamber, a point discussed in a paper read some time ago before the Institution of Engineers-in-Charge (London) by Mr. V. R. Chadwick, Technical Director of the Turbine Furnace Co., Ltd.

* * *



This is the Lister Auto-truck Milk Bar. Compact and neat it can be used for both indoor and outdoor functions and enables sales to be drawn from a wide area.

Bacon-curing room, being one of the number of chambers cooled by J. and E. Hall's refrigerating plant, at the Sheffield Farmers' Bacon Factory, Sherburn-in-Elmet. A temperature of 40° F. is maintained in the room. The cooling pipes will be observed on the roof of the chamber.



The curves of the Lowloss motor mentioned below.

New High Efficiency Motor

A new range of motors, the "E" Range, announced by Crompton Parkinson, Ltd., includes a machine which is of considerable interest to the food manufacturing industry.

This range has been developed to meet the requirements of certain industries who hitherto have not been able to obtain motors with completely suitable characteristics without entailing the very high cost of special design to individual requirements.

The range in effect is a rationalisation of special design. Although the manufacturers claim that the motors in the range provide characteristics which previously could only be obtained by special individual design, the cost is only very little more than that of standard machines.

Stoneware Tap

A stoneware acid-proof tap of new design has been produced by Doulton and Co. The usual fault with stoneware taps is that the conical key is inclined to stick, but by means of a specially designed stoneware ring, to which is attached a metal handle, gentle pressure is sufficient to allow the tap to turn quite freely.

* * *

Belting

Food manufacturers who are at present interested in the transmission drives of their machinery, will also be interested in the firm of J. H. Fenner and Co., Ltd., Hull. They specialise in belting and will be giving a demonstration of their "V", oil-resisting, rope at the Birmingham B.I.F. Also there will be a demonstration of the Egyptian cotton cords which are built into these ropes.

TRADE MARKS

This list of Trade Marks of interest to readers has been selected from the "Official Trade Marks Journal", and is published by permission of the Controller of H.M. Stationery Office. The "Trade Marks Journal" can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, price 1s. weekly (annual subscription £2 10s.).

ARGOSY.—581,296. **Tea.** C. A. SMALLBONE, LTD., Argosy House, 77 and 79, Beckenham Lane, Shortlands, Kent. January 19.

ATTA BOY.—582,128. **Edible oils and edible fats.** LATIMER IVEY, 12a, Disraeli Gardens, London, S.W. 15. January 19.

BLACK CAT.—580,865. **Tea and coffee.** BENJAMIN DANIEL COWEN, 170, Howard Street, Glasgow, C. 1. January 19.

CHIEFTAIN.—581,694. **A bread improver, being a flour and chemical preparation used in baking.** BRITISH FERMENTATION PRODUCTS, LTD., Chieftain Works, 128, Putney Bridge Road, Putney, London, S.W. 15. (Associated.) January 26.

DELAVITA.—581,952. **Biscuits.** THOMAS PARKINSON, LTD., Watery Lane, Preston, Lancashire. January 19.

DRAZ.—582,197. **Edible oils and edible fats.** LATIMER IVEY, 12a, Disraeli Gardens, London, S.W. 15. January 19.

EASTACURE.—580,806. **Cured fish.** EAST ATLANTIC FISHERIES, LTD., St. Magnus House, Monument Street, Billingsgate, London, E.C. 3. (By Consent.) January 12.

ELDERSCAN. — 582,196. **Biscuits and wheat flour.** ELDER DEMPSTER (GRAND CANARY), LTD., 1, Oxford Court, Cannon Street, London, E.C. 4. February 2.

FIMALT.—581,361. **Substances used as food or as ingredients in food, consisting of or containing malt extract.** EDWARD FISON, LTD., Stoke Bridge Maltings, Dock Street, Ipswich. (Associated.) February 2.

GRAPERON. — 582,219. **Substances used as food or as ingredients in food.** RUSSELL HARBOROUGH, LTD., 1 to 15, High Street, Redbourn, Hertfordshire. January 26.

GOLDOVA. — 581,570. **Preparations in liquid form for mixing with eggs when used as ingredients in cakes.** CHARLES GOLDREI, trading as Ch. Goldrei, Foucard and Son, Goldex House, 56 to 60, Newcomen Street, Borough, London, S.E. 1.

HOME SPUN.—579,162. **Brown bread.** CHIBNALL'S BAKERIES, LTD., 4, Chiswick Mall, London, W. 4. (By Consent.) February 2.

Registration of this trade mark shall give no right to the exclusive use of the words "Home Spun".

LENRITE.—581,995. **Biscuits.** WRIGHT'S BISCUITS, LTD., Rutland Street, South Shields. January 19.

MAID MARIAN.—581,938. **Bacon, butter, cheese, and eggs for food.** DANISH BACON CO., LTD., 9 to 13, Cowcross Street, West Smithfield. (Associated.) January 26.

NATIONAL.—B 578,518. **Kippers.** THE NATIONAL FISHCURING CO., LTD., Poyner-

Nook Road, Aberdeen. (By Consent.) January 26.

User claimed from February 20, 1927. Section 21.

PLANTOX.—581,141. **A yeast extract for use as a soup flavouring for soup.** FREDK. BOEHM, LTD., 17, Jewry Street, London, E.C. 3. (By Consent.) February 2.

PURPLE HEATHER.—580,714. **Fresh and cured fish.** LAWSON AND ASHTON, LTD., 10, West Dock Street, Kingston-upon Hull. February 2.

QUACK. — 582,018. **Confectionery and biscuits.** MARS CONFECTIONS, LTD., Bay, 1, Dundee Road, Trading Estate, Slough, Buckinghamshire. (Associated.) January 19.

NEW COMPANIES

Rex Milk Bars, Limited. (333018.) Registered October 26, 1937. 313, Edgware Road, Paddington, W. 2. To establish and carry on milk bars, etc. Nom. Cap.: £100 in £1 shares. Dirs.: H. A. J. Bernstein, 62, St. Quintin Avenue, North Kensington, W.; Mrs. B. Bernstein, 62, St. Quintin Avenue, North Kensington, W.

E. and E. Robinson, Limited. (333190.) 1/11/37. Cowkeepers, dairymen, etc. £500. Dirs.: A. P. Johnson, Woodview, Wyke, Bradford; Mrs. E. Johnson, Woodview, Wyke, Bradford.

Sea Foods, Limited. (333275.) 3/11/37. 5 and 6, Argyll Street, W. 1. Hotel, fish restaurant, and snack bar proprs., etc. £1,000. Dirs.: J. W. Nuthall, 102, Richmond Hill, Richmond; A. D. Hall, 5, Argyll Street, W. 1.

Silkifat Products, Limited. (332894.) Registered October 22, 1937. Haworth's Chambers, 24, Acresfield, Bolton. To carry on bus. as mnfrs. of and dlrs. in butter, margarine, oils and artificial fats, etc. Nom. Cap.: £1,000 in £1 shares. Dirs.: A. Silverman, 18, Winchester Avenue, Prestwich; P. Lodge, 53, Tootal Road, Weaste; R. I. Bender, 163, Sussex Street, Salford, 7.

Smittys Cafeterias, Limited. (332945.) Registered October 23, 1937. To carry on the bus. of cafeteria proprs., etc. Nom. Cap.: £5,000 in £1 shares. Dirs.: To be appointed by the subs.

Sorrell Bros., Limited. (333100.) Registered October 28, 1937. 64, Chatsworth Road, E. 5. To carry on the bus. of provision mchts. and pork butchers, etc. Nom. Cap.: £1,000 in £1 shares. Dirs.: Mrs. A. E. Sorrell, 14, Craven Walk, Clapton Common, N. 16; G. A. Sorrell, 7, Stainforth House, 96, Clapton Common, E. 5.

Sydenham and District Grocers (Wholesale), Limited. (332946.) Registered October 23, 1937. 58a, Church Street, Camberwell, S.E. 5. To carry on the bus. of wholesale grocers, etc. Nom. Cap.: £1,000 in £10 shares. Dirs.: J. F. Gosling, 45, Underhill Road, E. Dulwich, S.E. 22; W. T. Gosling, Woolacombe, Bampton Road, Forest Hill, S.E. 22; W. M. Boag, 24, Aldersmead Road, Beckenham; H. E. Cooke, 315, Sydenham Road, S.E. 26; H. H. Saunders, 86, Cherry Tree Walk, Beckenham.

Tasties, Limited. (332896.) Registered October 22, 1937. 14, Atlantic Chambers, 7, Brazennose Street, Manchester, 2. To carry on the bus. of dlrs. in cooked meats, etc. Nom. Cap.: £100 in £1 shares. Dirs.: Evelyn Greenwood, 808, Rochdale Road, Queens Park, Manchester; H. W. Hardy, 26, Wickenby Drive, Sale, Ches.; J. Greenwood, 808, Rochdale Road, Queens Park, Manchester.

Thomas (Pastrycooks), Limited. (332897. Registered October 22, 1937. 1362, High Road, Whetstone, N. 20. To carry on the bus. of pastrycooks, etc. Nom. Cap.: £1,000 in £1 shares. Dirs.: A. R. Thomas, 1362, High Road, Whetstone, N.20; R. H. Thomas, 61, Church Way, Whetstone, N. 20; Mrs. L. Thomas, 61, Church Way, Whetstone, N. 20.

Universal Milk Bars, Limited. (332001.) Registered October 22, 1937. To carry on the bus. of dairymen, etc. Nom. Cap.: £750 in £1 shares. Dirs.: To be appointed by the subs.

George Williams and Sons (Shrewton), Limited. (333196.) 1/11/37. To take over the bus. of bakers, grocers, and provision mchts. cd. on as "G. Williams and Sons". £500. Dirs.: G. J. Howard, Aingarth, Southbroom Road, Devizes, Wilts (permt.); Dorothy K. Howard, Aingarth, Southbroom Road, Devizes, Wilts.

Orlando Wilson and Company, Limited. (332989.) Registered October 25, 1937. Peck House, 20, Eastcheap, E.C. 3. To carry on the bus. of wine, spirit and beer mchts., grocers, etc. Nom. Cap.: £2,000 in £1 shares. Permt. dirs.: H. O. Wilson, 34, Ossian Road, Stroud Green, N. 4; A. J. Wilson, 23, The Avenue, Muswell Hill, N.

The above-mentioned particulars of new companies recently registered have been extracted from the daily register of Messrs. Jordan and Sons, Ltd., company registration agents, Chancery Lane, W.C. 2.

INFORMATION and ADVICE

Drying of Fruit Pulps—Cooking and Frying Fat—Gelatine for Kosher Trade —Safety First—Fish and Meat Pastes

Drying of Fruit Pulps

3,406. *I have been trying some laboratory experiments with the drying of fruit pulps by pumping hot air through them. I should be grateful if you would let me know whether this method has ever been applied in commercial practice, and if so, what temperatures are used and results achieved?* (Peshawar.)

After enquiry, we cannot ascertain that pumping hot air through fruit pulps in order to dry them has been applied in commercial practice in this country.

Cooking and Frying Fat

3,477. *We enclose herewith one or two labels of a cooking and frying fat (lard compound) showing a clause to the effect that the product therein contains 9 per cent. water.*

We have analysed various other brands, and they contain approximately 91 per cent. pure fat and 9 per cent. water, but in this case the covering clause does not appear on the outside wrapper.

As we are desirous of entering this market, we shall be glad if you will kindly inform us if it is legally necessary for this clause to appear on the wrapper of such a product. (Liverpool.)

You can put on the market an emulsified fat with a proportion of water so long as the words "Cooking Fat" does not appear. For instance, you could sell a product called "Lardo", and say that it is for making pastries and frying, but not that it is a cooking fat, because fat does not contain moisture.

If you do call it cooking fat, you will be obliged to include the clause showing the percentage of water.

Gelatine for Kosher Trade

3,535. *We are in the habit of using agar-agar, which as you know is very expensive, for the manufacture of our glass preserves, etc. As we are in the kosher trade and may only use animal matter that comes from kosher-killed carcases, we cannot use any isinglass or gelatine. We would like to know if there is a formula whereby either of those two articles can be processed by ourselves for our own use.* (Aldgate.)

We would suggest that you might use the feet and knees of oxen for making gelatine for your preserves.

The best way would be to treat these in an autoclave under pressure, but if you did not desire to go to the expense of a small autoclave you could treat them in a jacketed pan by boiling in water for some hours. The skimmed and filtered liquor would then be very rapidly evaporated, by means of the same jacketed pan, the degree of concentration depending on the stiffness of the gelatine you wish to obtain.

Safety First

3,557. *We read with interest an item on Blood Poisoning in your journal. We should be glad if you would let us have the full address of the National Safety First Association, as you say they offer to provide pamphlets for distribution among workers, and for this reason we would like to get in touch with them.* (Belfast.)

You will be able to obtain the pamphlets mentioned in FOOD MANUFACTURE at the National Safety First Association, 52, Grosvenor Gardens, London, S.W. 1.

Fish and Meat Pastes

3,499. *We should be much obliged if you would send us the latest recipes for the fish and meat pastes.* (South Africa.)

The following suggestion is for ham and tongue pastes, the addition of chicken depending on quality desired:

Corned beef	3½ lb.
Boiled ham	1 ,,
Boiled tongue	1 ,,
Butter or margarine	1 ,,

For seasoning:

White pepper	½ oz.
Ground parsley	¼ ,,
Marjoram	¼ ,,
Cayenne pepper	⅛ ,,

Salt added at discretion and, if filling is added, the proportion of seasoning must be brought up to the required proportion.

Salmon and Shrimp Paste.

Salmon	50 lb.
Bacon fat	12 ,,
Shrimps (skinned)	10 ,,

Flavour with sugar, cayenne, white pepper and ground mace.

Bloater Paste.

Bloaters	24 lb.
Bacon fat	16 ,,
Salmon	12 ,,
Anchovies	12 ,,
Rice flour	4 ,,

Add butter for high-class product and flavour with pepper and nutmeg.

Ingredients are mixed and minced well. The pots are filled to the top to exclude air, caps are rolled on and the jars sterilised.

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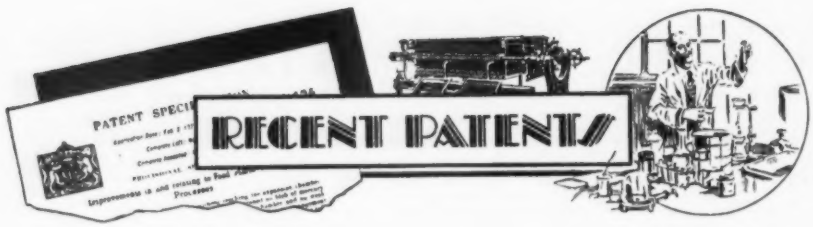

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Latest Patent Applications

163. Fermentata Akt.-Ges.: Manufacture of cheese. January 3.
654. Corn Products Co., Ltd., Beaver, A. E. A.: Foodstuffs. January 8.
730. Knubble, F.: Treatment of foodstuffs. January 10.
971. George, D., Griffiths, T.: Transport container for fish, etc. January 12.
1371. Compagnie International de Procedes de Panification Ilam and Soc. Found Springer: Treatment of yeast. January 14.
1372. Compagnie International de Procedes de Panification Ilam and Soc. Found Springer: Treatment of yeast. January 14.
1797. Carring, C. A. C.: Apparatus for shaping butter, etc. January 19.
1949. Colombo Commercial Co., Ltd., Salmon, R. M., Wiltshire, G. R., and Lawton, C. R.: Tea-rolling machines. January 19.
2492. Laurin, L., Laurin, S. L.: Fish-dressing machines. January 26.
28000. Volpertas, Z.: Reduction of vegetables containing starch to dry powder.
28016. Bauml, F.: Air-extraction, etc., for exhausting acid vapours from pickling, etc., plants.
28170. Weizmann, C.: Protein preparations.
28223. Giusti and Sons, Ltd., T.: Machines for filling receptacles, etc., with cream, etc.
28305. Rudd, F.: Pourers for sauce bottles, etc.
28317. Fairbrother, H. (Meier): Machines for shaping butter-rools, etc.
28464. Cooper, A. J.: Pumps for dispensing drinks.
28473. Wolff and Co. Kommandit-Ges.: Manufacture of artificial sausage skins, etc.
28518. Porter, R. M. M.: Packaging of bottled liquids.
29444. Huson, J. F.: Bean cutters.
29455. Dixon, B.: Apparatus for dealing with waste occurring in the filtration of beer.
29499. Western States Machine Co.: Centrifuging of sugar. (United States, December 1, 1936.)
29683. Lowe Food Products Co., Ltd., J.: Emulsifying apparatus.

Complete Specifications Accepted

474,050. Pointon, J. E., and Baker Perkins, Ltd.: Bakers' oven and the like.
474,158. Fairweather, H. G. C. (Tropical Fruit Preserves Proprietary, Ltd., and Whalley, R. Y.): Preservative particularly applicable to fruit. (April 27, 1936.)
474,226. Bennett, G. H.: Hermetic or vacuum closure for metal cans, boxes, and the like. (January 24, 1936.)
474,257. Munday, W. O. (legal representative of Munday, R. L., deceased): Plate heat-exchangers, particularly for treating milk, beer, and other liquids. (May 29, 1936.)
474,285. Harber, L. S., Wilson, J. F., and Baker Perkins, Ltd.: Apparatus for dispensing measured quantities of liquids. (March 25, 1936.)
474,288. Haber, G. G.: Manufacture of bread, rolls, or the like. (April 22, 1936.)
474,302. Wells, W. H., and Wisbech Cider Co., Ltd.: Production of beverages. (April 28, 1936.)
474,306. Murrish, J.: Apparatus for grading or sorting fruit and other substantially globular articles according to size. (July 1, 1936.)
474,359. Haber, G. G.: Grinding of grain or like cereals, and storing of flour so obtained. (April 22, 1936.) (Divided out of 474,288.)
474,475. Cleveland, F. J. (Pfeifer and Langen): Making of pectin-containing extracts.
474,541. Guant, J. G. (Vogt Processes, Inc.): Apparatus for refrigerating comestibles and particularly ice-cream bars. (August 27, 1936.)
474,597. Musher Foundation, Inc.: Preservation of solid edible fat-containing substances. (Cognate application 2519/36.) (January 28, 1935.)
474,657. Booth, V., Booth, W., Booth, E., and Booth, J.: Machines for cleaning and grading grain, peas, and the like. (February 10, 1937.)
474,666. Tomkins, R. G.: Preservation of citrus fruits.
474,737. Jefferies, W., and Peirce, Leslie and Co., Ltd.: Apparatus for extracting nut-shell oil. (August 28, 1936.) (Divided out of 472,195.)
474,782. Baker, G. R., Paterson, J. C., and Baker Perkins, Ltd.: Cutting or cutting and embossing machines for biscuit doughs and the like.
474,805. Chivers and Sons, Ltd., and Fison, F. J.: Closures for jars or like containers.
474,905. Jerne, H. J.: Method of curing pork, more particularly pork cuts.
474,944. Jung, R. (trading as Beeck, Inh. R., Jung, A.): Apparatus for the sterilisation of liquids. (December 20, 1935.)
475,790. Schafer, J. B.: Tin boxes and other like containers. (March 25, 1936.)
476,272. Piqué, J. J.: Storage of fresh fruit. (December 1, 1936.)

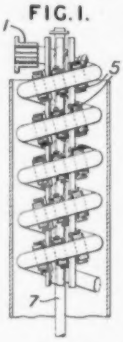
Printed copies of the full Published Specifications may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, at the uniform price of 1s. each.

Abstracts of Recent Specifications

Group Abridgments can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, either sheet by sheet as issued on payment of a subscription of 5s. per Group Volume, or in bound volumes price 2s. each.

471,566. Group IV. **Tubular films; sausage casings.** Naturin Ges. Ring-shaped tubes, particularly for sausage casings, are made by extruding a plastic kneadable fibrous mass of animal origin through an annular nozzle whilst blowing gases into the interior of the tube being formed, and withdrawing the tube helically. The fibrous mass is extruded through the nozzle 1 (Fig. 1) and the tube is passed helically around the series of rollers 5 within the drying channel. The rollers 5 are driven from the central shaft 7. A suitable extrusion nozzle is described in Specification 433,245. In order to produce tubes of uniform wall thickness, a tube is formed by extrusion through an annular nozzle with an eccentrically disposed core, and the tube is withdrawn so that the thickened part of the wall lies on the outside of the helix. Again, the fibrous mass may be extruded through an annular nozzle having a bevelled orifice, with or without rotating parts, and the curved tube thus formed withdrawn helically. The tubes, after drying, may be rendered resistant to boiling by treatment with water-displacing or tanning agents—*e.g.*, aluminium sulphate, alumina, tannin or products of the slow combustion, distillation, or carbonisation of cellulose- and lignin-containing products. The protein-containing fibrous pastes employed as starting materials may be obtained from hide, detanned leather, sinews, muscles, flesh, and the like by loosening or disintegrating and afterwards mechanically comminuting or shredding.

FIG. 1.



The specification as open to inspection under Section 91 describes also an extrusion device consisting of pots mounted on the framework and capable of being brought alternately into operative position on the table of the press. The fibrous mass is forced into the cylinder, which serves as a supply chamber and buffer. Pressure is maintained in this cylinder by means of the press. From the cylinder the mass is fed alternately into the high-pressure cylinders, which force it into the annular nozzle, consisting of a stationary part and a rotatable core. Air is blown in through the hollow axle. This subject-matter does not appear in the specification as accepted.